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Running for the exit: international banks and crisis transmission

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Abstract

The global financial crisis has reignited the debate about the risks of financial globalisation, in particular the international transmission of financial shocks. We use data on individual loans by the largest international banks to their various countries of operations to examine whether banks' access to borrower information affected the transmission of the financial shock across borders. The simultaneous use of country and bank-fixed effects allows us to disentangle credit supply and demand and to control for general bank characteristics. We find that during the crisis banks continued to lend more to countries that are geographically close, where they are integrated into a network of domestic co-lenders, and where they had gained experience by building relationships with (repeat) borrowers.

Keywords: Crisis transmission, sudden stop, cross-border lending, syndicated loans

JEL Classification Number: F36, F42, F52, G15, G21, G28

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1. Introduction

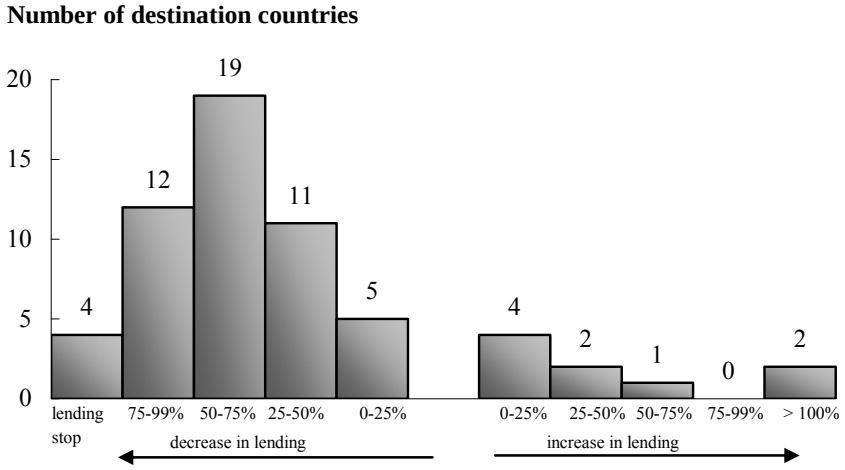
In the wake of the 2007–2009 economic crisis, the virtues and vices of financial globalisation are being re-evaluated. Financial linkages between countries, in particular in the form of bank lending, have been singled out as a key channel of international crisis transmission. The International Monetary Fund (IMF) and the G-20 have identified the volatility of cross-border capital flows as a priority related to the reform of the global financial system (IMF, 2010). A pertinent question that is high on the policy and academic agenda is why cross-border bank lending to some countries is relatively stable whereas it is more volatile in other cases. The recent crisis, which originated in the US sub-prime market but spilled over to much of the developed and developing world, provides for an ideal testing ground to answer this question.

After the collapse of Lehman Brothers in September 2008, syndicated cross-border lending declined *on average* by 53 percent compared to pre-crisis levels (Dealogic Loan Analytics). Figure 1 illustrates, however, that the magnitude of this reduction in international bank lending differed substantially across countries.

Figure 1

Distribution of the change in cross-border lending after the Lehman Brothers collapse

This figure shows the distribution across destination countries of the change in the average monthly cross-border syndicated lending inflows after the collapse of Lehman Brothers compared to the pre-crisis period. The pre-crisis period is defined as January 2005 to July 2007 and the post-Lehman period as October 2008 to October 2009. Each bar indicates the number of destination countries that experienced a post-Lehman change in bank lending that falls within the percentage bracket on the horizontal axis. For instance, there were 11 countries to which cross-border syndicated bank lending *declined* by between 25 and 50 per cent while there were only 2 countries that experienced an *increase* in cross-border syndicated lending of between 25-50 per cent. In 16 countries (4+12) lending declined by more than 75 per cent.



In this paper we hypothesise that cross-border lending was reduced most to countries where banks were unable to limit the increase in uncertainty through generating additional information about borrowers and had to resort to credit rationing instead. We use unique data

on lending by international banks to corporate borrowers in a large number of countries to put this theoretical prior to the test and to demonstrate that access to borrower information is a key determinant of lending stability in times of crisis.

The use of micro data allows us to make a significant contribution to the emerging literature on the transmission of the recent crisis. A number of papers use *aggregate* data from the Bank for International Settlements (BIS) to study the 2008/2009 contraction in international bank lending. They find that international banks contributed to the spreading of the crisis and that this impact was most severe in the case of banking *sectors* that were vulnerable to US dollar funding shocks (Cetorelli and Goldberg, 2011), that displayed a low *average* level of profitability or high *average* expected default frequency (McGuire and Tarashev, 2008), or that had a poor *average* stock-market performance (Herrmann and Mihaljek, 2010). Takáts (2010) shows that supply factors –proxied by the volatility of the S&P 500 Financial Index– were a more important driver of the reduction in lending to emerging markets than local demand. Finally, Hoggarth, Mahadeva and Martin (2010) argue on the basis of aggregate BIS data and information from market participants that the reversal in cross-border credit flows may have been concentrated in banks' 'non-core' or 'peripheral' markets. The authors speculate that banks reduced their exposures in particular to those countries where they knew borrowers less well.

While these papers provide broad insights into the determinants of aggregate bank lending, they do not tell us what type of banks transmitted the crisis to what type of borrowers in what type of countries. It remains unclear whether banks reduced their cross-border lending across the board or only to particular 'non-core' countries. This is not only unfortunate from an academic perspective but also from the point of view of policy-makers who want to gauge international banks' commitment to their country during times of crisis.

An empirical analysis to answer these finer questions needs to be based on bank-level data, ideally on loan flows from individual banks to individual countries over a prolonged period of time. Data should contain lending to various countries from individual banks (to exploit within-bank variation) as well as lending flows from various banks to individual countries (to control for credit demand at the country level). And finally, such data should preferably contain the individual deals that underlie credit flows, so that micro-information on borrowers and on inter-bank cooperation can be exploited. We use data on cross-border syndicated bank lending that fulfil all of these requirements.

Loan syndications – groups of financial institutions that jointly provide a loan to a corporate borrower – are one of the main channels of cross-border debt finance to both developed and emerging markets.[1] In 2007, international syndicated loans made up over 40 percent of all cross-border funding to US borrowers and more than two-thirds of cross-border flows to emerging markets.[2] We concentrate on the 118 largest banks in the cross-border syndicated loan market, which together account for over 90 per cent of this market. We use data on individual cross-border deals to construct, for each of these banks, a monthly snapshot of their credit flows to firms in individual countries. This allows us to compare post-crisis and pre-crisis lending by each bank to each country.

We use regression techniques to explain this lending behaviour through variables that measure the ability of banks to screen and monitor borrowers in particular destination countries. We control for changes in credit demand and other destination country variables by using destination country-fixed effects – in effect analysing how different banks change their lending to the same country differently (within-country comparison). Moreover, we control for bank-specific characteristics by using bank-fixed effects; in effect analysing how a particular bank changes its lending to different countries differently (within-bank comparison). This combination of country- and bank-fixed effects allows us to narrowly focus on information variables that are specific to particular bank-country pairs and to empirically isolate the impact of these variables on the stability of international lending relationships.

We find that during the global financial crisis banks were better able to keep lending to countries that are geographically close, in which they are well integrated into a network of domestic co-lenders, and in which they had gained experience by building relationships with (repeat) borrowers. For emerging markets, where trustworthy 'hard' information is less readily available and a local presence might be more important, we also find (weak) evidence that the presence of a local subsidiary stabilises cross-border lending. Our analysis shows that information asymmetries between banks and their foreign customers are an important determinant of the resilience of cross-border lending during a crisis. Even in a 'hard information' setting, such as the market for syndicated corporate loans, access to soft information seems to be important.

[1] We define emerging markets as all countries except high-income Organisation for Economic Co-operation and Development (OECD) countries. Although Slovenia and South Korea were recently reclassified as high-income countries, we still consider them as emerging markets.

[2] Cross-border funding is defined as the sum of international syndicated credit, international money market instruments, and international bonds and notes (Bank for International Settlements, Tables 10, 14[a], and 14[b]).

This paper not only contributes to the emerging literature on the transmission of the recent crisis, but also complements a number of studies that analyse financial contagion through international bank lending. Van Rijckeghem and Weder (2001, 2003), for example, find that international banks that are exposed to a financial shock –either in their home or in a third country– reduce lending to other countries. Jeanneau and Micu (2002) show that cross-border lending is determined by macroeconomic factors, such as the business cycle and the monetary policy stance, in both home and host country. Buch, Carstensen and Schertler (2010) analyse the cross-border transmission of shocks and find that interest rate differentials and also energy prices influence international bank lending. This paper goes beyond assessing the impact of macroeconomic factors on international bank lending. We instead test a number of hypotheses on mechanisms that banks use to mitigate information problems that hitherto have not been analysed in an international context.

Our paper is also related to the work of Schnabl (2011) and Aiyar (2010) who focus on the reduction in cross-border lending to Peruvian banks after the 1998 Russian default and to British banks after the 2008 Lehman Brothers collapse, respectively. Both authors find that these external funding shocks forced banks to contract domestic lending. We also focus on the Lehman Brothers collapse as an external liquidity shock, but instead assess how this shock was transmitted across borders to both bank and non-bank borrowers.

In addition, this paper adds to the literature on multinational banking. A number of papers demonstrate that foreign affiliates of multinational banks can act as shock transmitters. Peek and Rosengren (1997, 2000) show how the drop in Japanese stock prices in 1990 led Japanese bank branches in the US to reduce credit. Imai and Takarabe (2011) find that Japanese nationwide city banks transmitted local real estate price shocks to other prefectures within Japan as well. In line with this evidence, Allen, Hryckiewicz, Kowalewski and Tümer-Alan (2010), De Haas and Van Lelyveld (2010), and Popov and Udell (2010) find that lending by multinational bank subsidiaries depends on the financial strength of the parent bank. Our paper is related to this literature as we compare cross-border lending by banks with and without a subsidiary in a particular destination country. In doing so we connect the literature on the stability of international and multinational bank lending.

The paper proceeds as follows. Section 2 reviews the literature on distance and borrower information and derives the theoretical priors that we test in this paper. Section 3 explains our data and econometric methodology, after which Section 4 describes our empirical findings, a set of robustness tests, and extensions of our main results. Section 5 concludes.

2. Distance, borrower information, and lending stability

There exists by now a substantial theoretical and empirical literature that analyses how banks (try to) overcome agency problems vis-à-vis (potential) customers. Banks screen new borrowers and monitor existing ones to reduce information asymmetries and the agency problems associated with debt (Allen, 1990). Banks' ability to screen and monitor varies across borrowers: agency problems are more pronounced for opaque and small companies. Banks need to exercise considerable effort to collect 'soft' information about such borrowers, for instance by building up a lending relationship over time (Rajan, 1992; Ongena, 1999). When screening and monitoring is difficult, the scope for adverse selection and moral hazard remains high and banks resort to credit rationing (Stiglitz and Weiss, 1981). Because opaque borrowers are particularly difficult to screen and monitor they experience more credit rationing than transparent firms (Berger and Udell, 2002).

Banks' screening and monitoring intensity also varies over time. An adverse economic shock increases the marginal benefits of screening and monitoring as the proportion of firms with a high default probability increases (Ruckes, 2004).[3] During a recession or crisis the net worth of firms drops, adverse selection and moral hazard increase, and banks step up their screening and monitoring (Rajan, 1994 and Berger and Udell, 2004). However, banks face difficulties in offsetting increased agency problems if borrowers are opaque. In response to an adverse shock they therefore resort to credit rationing of such intransparent borrowers in particular ('flight to quality', Bernanke, Gertler and Gilchrist, 1996). In a similar vein, we expect that during the recent crisis banks reduced cross-border lending the most to countries where they were unable to limit the increase in uncertainty through generating additional borrower information and resorted to credit rationing instead. Economic theory suggests a number of factors that influence whether a bank is able to limit agency problems.

First, we consider the geographical distance between the bank and its borrowers (Petersen and Rajan, 1994; 2002). Distant borrowers are more difficult to screen and monitor and banks therefore lend less to far-away clients (Jaffee and Modigliani, 1971; Hauswald and Marquez, 2006). In line with geographical credit rationing, Portes, Rey, and Oh (2001); Buch (2005); and Giannetti and Yafeh (2008) document a negative relationship between distance and international asset holdings, including bank loans. Agarwal and Hauswald (2010) show how the negative relationship between bank-borrower distance and credit availability is largely

[3] By contrast, during boom periods default probabilities are low and the advantages of screening and monitoring – such as reduced shirking by firm management – mostly benefit shareholders rather than creditors.

due to the inability to collect and make use of 'soft' information. We therefore expect that, in line with an international flight to quality, distant firms were rationed more by international banks during the crisis than less remote companies. That is, we expect a negative relationship between distance and bank lending stability.

A mechanism for banks to overcome distance constraints in cross-border lending is to set up a local subsidiary (Mian, 2006; Giannetti and Yafeh, 2008). A presence on the ground reduces information asymmetries as local loan officers are better placed to extract soft information from borrowers. Developing closer ties with clients may allow the bank to continue to lend to borrowers during periods of high uncertainty because screening and monitoring can be stepped up quite easily. Local staff on the ground can also make it easier for a bank to generate (and subsequently monitor) new cross-border deals. Berger, Miller, Petersen, Rajan, and Stein (2005) argue that (small) banks that use soft information may sustain longer relationships with clients because they provide clients with better lending terms, compared to banks that lack access to such information. In a similar vein, we hypothesise that a bank with a subsidiary may find it easier to continue to lend cross-border, since the subsidiary generates (soft) information that allows the bank to refrain from adjusting lending terms too much. Finally, because soft information is not easily transferable across banks, international banks with a local subsidiary may have greater market power over firms than banks without a subsidiary. Firms that are a client of a bank with a local presence may find it more costly to switch to another bank during a crisis and the lending relationship may therefore be more stable.

While a local subsidiary reduces the physical distance between the firm and the loan officer, it also creates 'functional distance' within the bank.[4] Banks may experience difficulties in efficiently passing along (soft) information from the subsidiary to headquarters (Aghion and Tirole, 1997; Stein, 2002). Liberti and Mian (2009) show that when the hierarchical distance between the information collecting agent and the officer that ultimately approves a loan is large, less 'soft' or subjective and more 'hard' information is used. If the incentives of subsidiary managers are not aligned with those of the parent bank, internal agency costs (Scharfstein and Stein, 2000) may hamper cross-border lending as well. Such costs increase with distance if parent banks find it more difficult to supervise management in far-away

[4] Cerqueiro, Degryse, and Ongena (2009) provide an excellent overview of the literature on the relationship between distance, banks' organisational structure and the supply of bank lending.

places (Rajan, Servaes, and Zingales, 2000).[5] Whether the presence of a subsidiary makes cross-border lending more stable or not therefore depends on whether the positive effect of the shorter distance between loan officer and borrower is offset by the negative effect of a longer within-bank functional distance.

Another way for banks to overcome distance constraints in cross-border lending is to cooperate with domestic banks. These banks may possess a comparative advantage in reducing information asymmetries vis-à-vis local firms (Mian, 2006; Houston, Itzkowitz, and Naranjo, 2007), as they share the same language and culture and may have a more intimate knowledge of local legal, accounting, and other institutions and their impact on firms. In line with this, Carey and Nini (2007) find that local bank participation leads to larger, longer, and cheaper syndicated loans. Borrowers may still value the presence of foreign banks if these are part of international bank networks that provide firms with a deeper and more liquid loan base, further reducing borrowing costs (Houston et al., 2007). By (repeatedly) co-lending with domestic banks, international banks may gradually increase their own knowledge of local firms and reduce information asymmetries. We therefore expect that international banks that are well-integrated in a lending network of domestic banks may find it easier to continue lending during a period of severe financial stress.

Finally, the negative effect of distance on the ability to screen and monitor may become less acute the more experience a bank has built up in lending to certain borrowers. De Haas and Van Horen (2010) find that in the wake of the Lehman collapse agency problems increased less for banks lending to firms, industries, or countries that they had been lending to before. In line with this, we expect that during the financial crisis banks reduced their lending to a lesser extent to countries where they had built up substantial pre-crisis lending experience.

Section 3 now describes the data and methodology that we use to test to what extent distance, subsidiary presence, cooperation with domestic banks, and lending experience influenced the severity of the sudden stop in lending from individual banks to individual countries.

[5] Alessandrini, Presbitero, and Zazzaro (2009) show for Italy that a greater functional distance between loan officers and bank headquarters adversely affects the availability of credit to local firms.

3. Data and econometric methodology

3.1. Data

Our main data source is the Dealogic Loan Analytics database, which provides comprehensive market information on virtually all syndicated loans issued since the 1980s. We use this database to download all syndicated loans to private borrowers worldwide during the 2005-09 period and then break each syndicated loan down into the portions provided by the individual banks that make up the syndicate. Loan Analytics provides precise information on loan breakdown for about 25 per cent of all loans. For these loans we allocate the exact loan portions to the individual lenders in the syndicate.[6] For the other 75 per cent of the loans we have to use a rule to allocate loan portions. For our baseline regressions we use the simplest rule possible: we divide the loan equally among all lenders. In Section 4.2 we describe various robustness tests that show that our results continue to hold when we allocate the 75 per cent of the loan sample in various other ways over the syndicate members. In total we split 23,237 syndicated loans into 108,530 loan portions.

We then use these loan portions to reconstruct the volume and country distribution of individual banks' monthly lending over the sample period. We focus on actual cross-border lending, which we define as loans where the nationality of the (parent) bank is different from the nationality of the borrower and where the loan is provided by the parent (Citibank lending from the United States to a Polish firm), rather than by a subsidiary (Citibank Poland participating in a syndicated loan to a Polish firm). The vast majority (94 per cent) of cross-border lending is of the former type and therefore included in our dataset.

Next, we identify all commercial banks, savings banks, cooperative banks, and investment banks that at the group level provided at least 0.01 per cent of global syndicated cross-border lending and participated in at least twenty cross-border loans in 2006. This leaves us with 118 banks from 36 countries, both advanced (75 banks) and emerging markets (43 banks). Together these banks lent to borrowers in 60 countries and accounted for over 90 per cent of all cross-border syndicated lending in 2006.

Tables A1 and A2 in the Appendix list all banks and destination countries in our sample, respectively. Table A1 also shows each bank's country of incorporation, as well as its absolute and relative position in the global market for cross-border lending. Although most

[6] See De Haas and Van Horen (2010) for a comparison of syndicated loans with full versus limited information on loan distribution in Loan Analytics and for evidence on the limited differences between both.

banks have a pre-crisis market share of less than 1 per cent, there are a number of big players which each make up more than 3 per cent of the market: RBS/ABN Amro (8.3 per cent), Deutsche Bank (5.4), BNP Paribas (5.1), Citigroup (4.9), Barclays (4.7), Credit Suisse (3.6), Mitsubishi UFJ (3.4), JPMorgan (3.2), and Commerzbank (3.1).[7]

For each of these banks we calculate monthly cross-border lending volumes to individual destination countries for the pre-crisis period (January 2005-July 2007) and the period after the Lehman collapse (October 2008-October 2009). Note that we disregard the intermediate August 2007-September 2008 period that encompasses the early stage of the crisis. This allows us to make a clean comparison between the most severe crisis period, the year after the unexpected collapse of Lehman Brothers, and the period before the start of interbank liquidity problems in August 2007. In Section 4.2 we discuss robustness tests that show that our results continue to hold when we change this time window.

We use the percentage change between these post-Lehman and pre-crisis average amounts of cross-border lending as our first dependent variable (*Volume*). We also construct a dummy variable *Sudden stop* that is 1 for each bank-country pair where the decline in bank lending during the crisis exceeded 75 per cent. Finally, we create a dependent variable that measures for each destination country the percentage change in the number of syndicates that a lender arranged or participated in (*Number*).[8] To reduce the probability that our results are affected by outliers we exclude observations above the 97th percentile for *Volume* and *Number*.

Table 1 shows that our dataset includes 2,146 bank-country pairs which are approximately evenly split between emerging markets and advanced countries. On average an international bank was lending to firms in 18 different countries before the demise of Lehman Brothers. The table shows that banks reduced their lending on average by 64 per cent during the crisis to any destination country (60 per cent to advanced countries and 68 per cent to emerging markets). The variable *Sudden stop* indicates that banks let their lending even decline by 75 per cent or more in 62 per cent of the countries. Sudden stops were more common in emerging markets (68 per cent) compared to advanced markets (54 per cent). In terms of

[7] During our sample period RBS acquired part of ABN Amro; Bank of America acquired Merrill Lynch; and Wells Fargo acquired Wachovia. We consider these merged banks as a single entity over our whole sample period. We add the number of loans their respective parts provided during the pre-merger period and calculate other bank-specific variables as weighted averages, using total assets of the pre-merger entities as weights.

[8] Note that complete information is available to construct this dependent variable. Even though we only have loan share information for 25 per cent of the sample, we do have the total loan volume and the names of all lenders in each syndicate. So the change in the number of loans of bank *i* to country *j* is measured without error.

number of loans, we see that the decline was even sharper than in terms of loan volume, indicating that in particular smaller loans were discontinued during the crisis.

Table 1
Summary statistics

The table shows summary statistics for our main variables. Table A3 in the Appendix contains information on all variable definitions, the units and period of measurement, and the data sources.

	Unit	Obs	Mean	Median	St Dev	Min	Max
Dependent variables							
Change in cross-border lending (volume)	%	2,082	-64	-96	60	-100	237
Change in cross-border lending to advanced countries (volume)	%	975	-60	-83	58	-100	237
Change in cross-border lending to emerging markets (volume)	%	1,107	-68	-100	62	-100	234
Sudden stop	Dummy	2,146	0.62	1	0.49	0	1
Sudden stop to advanced countries	Dummy	1,005	0.54	1	0.50	0	1
Sudden stop to emerging markets	Dummy	1,141	0.68	1	0.47	0	1
Change in cross-border lending (numbers)	%	2,100	-89	-97	15	-100	-33
Change in cross-border lending to advanced countries (numbers)	%	980	-87	-91	15	-100	-33
Change in cross-border lending to emerging markets (numbers)	%	1,120	-92	-100	14	-100	-33
Information variables							
Distance	Km	2,146	4,772	3,604	3,764	102	14,966
Subsidiary	Dummy	2,146	0.16	0	0.37	0	1
Domestic lenders	%	2,146	34	30	25	0	100
Experience	No. loans	2,146	34	10	123	0	2,242
Control variables							
Exposure	%	2,150	0.45	0.10	2.26	0	90.64
State support	Dummy	2,150	0.47	0	0.50	0	1
Bank size (2006)	USD billion	2,125	780	555	723	2	3,011
Bank solvency (2006)	%	2,125	5.58	5.26	2.67	1.56	18.55
Change in bank solvency (2006-2009)	% points	2,125	0.37	0.28	1.17	-2.87	3.68
Bank liquidity (2006)	%	2,125	54	37	51	2	376
Change in bank liquidity (2006-2009)	% points	2,125	-7.54	-4.81	23.36	-70.36	114.95

We create a number of variables that measure for individual bank-country combinations the ability of banks to mitigate the increase in information costs during the crisis ('Information variables' in Table 1). We start with using the great circle distance formula to calculate the geographical distance between each bank's headquarters and its various countries of operations as the number of kilometres between the capitals of both countries. The average distance to a foreign borrower is 4,772 km, but there exists considerable variation (the standard deviation is 3,764 km).

Second, we link each of our banks to Bureau van Dijk's BankScope database, which not only contains information on balance sheets and income statements but also on ownership structure (both of the banks themselves and their minority and majority equity participations). For each bank we identify all majority-owned foreign bank subsidiaries. We create a dummy variable *Subsidiary* that is one in each country where a particular bank owns a subsidiary. A

typical bank owns a subsidiary in three foreign countries and this means that in about 16 per cent of our bank-country pairs a subsidiary is present.

Third, we count for each bank in each of its countries of operations the number of different domestic banks with which it has cooperated in a syndicate since 2000. We divide this number by the total number of domestic banks that are active in a particular destination country to create the variable *Domestic lenders*. A better embedding in a network of local banks may allow a bank to become less of an 'outsider' and to 'free-ride' on the ability of local banks to generate information about local borrowers. On average a bank has worked with 15 different domestic banks in a given country, which is 34 per cent of the average number of domestic lenders. Variation is large, however, with some international banks never cooperating with domestic banks, whereas others have cooperated at least once with each domestic bank.

Fourth, we create a variable that measures a bank's prior experience in syndicated bank lending to a specific country. We measure *Experience* as the number of loans that a bank provided to a particular country since 2000 and that had matured by August 2007 (we exclude still outstanding loans as these are included in the separate variable *Exposure*). The average number of prior loans is 34 and ranges between 0 and 2,242.

In addition, we create a number of control variables. The first one is *Exposure*, which measures for each bank-country combination the amount of outstanding syndicated debt as a percentage of the bank's total assets at the time of the Lehman collapse. On average this outstanding exposure was close to 0.5 per cent of the parent bank's balance sheet. We are agnostic about the impact of this variable on the severity of the lending decline. Banks may have adjusted their lending the most to countries where they had relatively high pre-crisis exposures, for instance because risk limits became more binding for such countries. On the other hand, banks may have mainly retrenched from 'marginal', non-core countries while staying put in their core markets (as defined by the pre-crisis portfolio share).

The other control variables are bank-specific and do not vary across destination countries. We only include these in regression specifications without bank fixed effects, in order to learn more about what type of banks reduced their international bank lending the most. We use two variables that control for the pre-crisis (2006) financial strength of each bank. These are *Solvency* (equity/total assets) and *Liquidity* (Liquid assets/deposits and other short-term funding). Controlling for banks' pre-crisis financial strength is important as banks with weak

balance sheets can be expected to reduce foreign exposures the most (McGuire and Tarashev, 2008; De Haas and Van Lelyveld, 2010). We also include these variables as changes over the 2006-2009 period to take into account that banks not only differed in terms of initial conditions but also in terms of how hard they were hit by the financial crisis. Banks differed in particular with regard to their dependence on short-term US dollar liquidity to fund foreign US dollar claims (McGuire and Von Peter, 2009).

Finally, we include a dummy variable *State support* that indicates whether a bank received government support during the crisis. To create this dummy, we develop a database of all financial support measures – capital injections, loan guarantees, and removals of toxic assets – since the onset of the crisis. Thirty per cent of the banks in our sample received some form of official government support and this translates into 47 per cent of the bank-country pairs. State support can be seen as an indicator of a bank's financial fragility during the crisis and thus as a proxy for the bank's need to deleverage – including through reducing cross-border lending. In addition, Kamil and Rai (2010) suggest that public rescue programmes may also have *caused* banks to 'accelerate the curtailment of cross-border bank flows'. Anecdotal evidence indeed suggests that rescue packages came with strings attached as banks were asked to refocus on domestic lending. For instance, when the UK government decided to guarantee a substantial part of Royal Bank of Scotland's assets, the bank "promised to lend £ 50 billion more in the next two years, expanding its *domestic* loan book by a fifth (*The Economist*, 28 February 2009, p. 37, italics added). Likewise, French banks that received state support had to increase domestic lending by 3-4 per cent annually, while Dutch bank ING announced that it would lend US$ 32 billion to Dutch borrowers in return for government assistance (World Bank, 2009, p. 70).

3.2. Econometric methodology

To examine whether increased information costs and banks' ability to mitigate such costs impact the cross-border transmission of a financial shock, we use the bankruptcy of Lehman Brothers as an exogenous event that triggered a sudden stop in cross-border lending. By comparing the average monthly lending volume (or number of loans) after the Lehman collapse to average monthly lending before the start of the crisis, we control for all time-invariant characteristics of recipient countries that influence the level of cross-border lending (such as the institutional environment and the level of economic development), plus all time-invariant factors that affect the lending volume of bank *i* to country *j*. This allows us to focus

on testing for heterogeneous bank behaviour as a result of differences in how banks deal with information asymmetries vis-à-vis foreign borrowers. Collapsing the monthly time-series information on lending into pre-crisis and post-Lehman averages also prevents inconsistent standard errors due to auto-correlation (Bertrand, Duflo, and Mullainathan, 2004).

We use country-fixed effects to focus on differences *across* banks *within* countries. A key advantage of this approach is that it allows us to neatly control for changes in credit demand at the country level. In particular, we follow Khwaja and Mian (2008) and Schnabl (2011) who control for credit demand at the firm level by using firm-fixed effects in regressions on a dataset of firms that borrow from multiple banks. Since our dataset contains information on multiple banks lending to the same country, we can use country fixed effects to rigorously control for credit demand at the host country level (cf. Cetorelli and Goldberg, 2011). This is important because the crisis hit the real economy of countries to a different extent and with a different lag. Firms' demand for external funds to finance working capital and investments has consequently been affected to varying degrees. Summarising, our model specification is:

$$\Delta L_{ij} = \beta' \cdot I_{ij} + \gamma' \cdot X_i + \varphi_j + \eta_{ij} \quad (1)$$

where subscripts i and j denote individual banks and destination countries, respectively, β' and γ' are coefficient vectors, I_{ij} is a matrix of information variables for individual bank-destination country pairs, X_i is a matrix of bank-specific control variables, φ is a vector of country-fixed effect coefficients, and η is the error term. ΔL_{ij} is one of our three dependent variables: *Volume* (the percentage change in the average monthly cross-border lending volume by bank i to country j in the post-Lehman compared to the pre-crisis period), *Numbers* (the percentage change in the average monthly number of cross-border loans by bank i to country j in the post-Lehman compared to the pre-crisis period), or *Sudden stop* (a dummy that is 1 for each bank-country combination where the decline in bank lending during the crisis exceeded 75 per cent).

We also estimate regressions in which we substitute the bank-specific control variables for bank-fixed effects. Since banks are active in multiple countries, we can use bank-fixed effects in addition to the country-fixed effects which allows for the most rigorous testing of the bank-country pair information variables. These regressions thus take the following form:

$$\Delta L_{ij} = \beta' \cdot I_{ij} + \varepsilon_i + \varphi_j + \eta_{ij} \quad (2)$$

where ε is a vector of bank-fixed effects. We estimate all our models using OLS except for the *Sudden stop* regressions where we use a logit model. Standard errors are robust and clustered by bank.

4. Empirical results

4.1. Baseline regression results

Tables 2 and 3 present the results from our baseline regressions. Table 2 first shows regressions based on the full dataset for our three dependent variables: *Volume*, *Sudden stop*, and *Numbers*. These regressions include either bank-specific controls or bank-fixed effects. For reasons of brevity we do not show the control variables for the last two dependent variables (the statistical and economic significance of the related coefficients is very similar to those reported for *Volume*). In Table 3 we then split the sample into lending to advanced countries and emerging markets. Here, we only present the results of our bank-fixed effects' regressions. We explain between 20 and 30 per cent of the variation in banks' post-Lehman retrenchment from specific countries.

It appears that cross-border lending to countries in which a bank owns a *Subsidiary* is more stable. The first two columns of Table 2 show that lending to countries with a *Subsidiary* was reduced significantly less, in terms of volume and number of loans. The probability of a very sharp decline –a *Sudden stop* of 75 per cent or more– is also significantly lower. However, when we add other explanatory variables to the combined regressions on the right-hand side, it turns out that the *Subsidiary* effect is dominated by these other variables. Table 3 shows that the *Subsidiary* effect is more robust in emerging markets, arguably because in these countries trustworthy 'hard' information is less readily available and a local presence may be more important. On average banks reduced the amount of lending and the number of loans to an emerging market with a subsidiary by 12 and 4 percentage points less, respectively, compared to an emerging market without a subsidiary (based on the combined bank-fixed effects' regressions in the lower panel of Table 3).

Table 2
Information and crisis transmission - Baseline results

This table shows estimations to explain the decline in cross-border lending from bank *i* to destination country *j* after the Lehman Brothers default. Table A3 in the Appendix contains definitions of all variables. Regressions include either bank-specific control variables or fixed effects (for reasons of brevity the bank controls are not shown in the *Sudden stop* and *Numbers* regressions). All specifications include destination country fixed effects. We use an OLS (*Volume* and *Numbers* regressions) or a logit (*Sudden stop*) model. Standard errors are heteroskedasticity robust and clustered by bank. Coefficients are marginal effects. Robust p-values appear in brackets and ***, **, * correspond to the one, five and ten per cent level of significance, respectively.

	Volume									
Subsidiary	0.122***	0.117**							0.066	0.056
	[0.006]	[0.013]							[0.131]	[0.210]
Distance			-0.043**	-0.073***					-0.016	-0.048**
			[0.021]	[0.000]					[0.376]	[0.016]
Domestic lenders					0.362***	0.369***			0.281***	0.264***
					[0.000]	[0.000]			[0.000]	[0.002]
Experience							0.051***	0.059***	0.011	0.014
							[0.000]	[0.000]	[0.466]	[0.379]
Exposure	0.025	-0.449	0.006	-1.153	-0.243	-1.541	-0.255	-1.771	-0.342	-2.771**
	[0.902]	[0.707]	[0.978]	[0.371]	[0.272]	[0.237]	[0.231]	[0.199]	[0.185]	[0.048]
State support	-0.078**		-0.085**		-0.088**		-0.088**		-0.091**	
	[0.019]		[0.019]		[0.011]		[0.013]		[0.010]	
Bank size	0.058***		0.073***		0.049***		0.045***		0.049***	
	[0.000]		[0.000]		[0.000]		[0.000]		[0.001]	
Solvency	1.407**		1.632**		1.173*		1.195*		1.274*	
	[0.028]		[0.016]		[0.065]		[0.061]		[0.063]	
Solvency change	-0.602		-0.412		-0.942		-0.541		-0.935	
	[0.658]		[0.774]		[0.521]		[0.705]		[0.527]	
Liquidity	0.015		0.018		0.031		0.026		0.032	
	[0.647]		[0.611]		[0.328]		[0.409]		[0.312]	
Liquidity change	-0.223***		-0.199***		-0.211***		-0.208***		-0.191***	
	[0.001]		[0.005]		[0.001]		[0.001]		[0.004]	
Bank FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	2,057	2,082	2,057	2,082	2,031	2,056	2,057	2,082	2,031	2,056
R-squared	0.204	0.266	0.203	0.27	0.212	0.275	0.206	0.268	0.215	0.28
	Sudden stop									
Subsidiary	-0.138***	-0.146***							-0.040	-0.053
	[0.000]	[0.000]							[0.309]	[0.226]
Distance			0.084***	0.110***					0.047**	0.072***
			[0.000]	[0.000]					[0.012]	[0.002]
Domestic lenders					-0.570***	-0.588***			-0.371***	-0.360***
					[0.000]	[0.000]			[0.000]	[0.000]
Experience							-0.096***	-0.117***	-0.041**	-0.054**
							[0.000]	[0.000]	[0.027]	[0.018]
Observations	2,026	1,960	2,026	1,960	1,998	1,934	2,026	1,960	1,998	1,934
Pseudo R-squared	0.168	0.226	0.176	0.235	0.188	0.244	0.181	0.238	0.196	0.255
	Numbers									
Subsidiary	0.041***	0.035***							0.029***	0.024***
	[0.000]	[0.000]							[0.001]	[0.007]
Distance			-0.013***	-0.015***					-0.006	-0.010**
			[0.001]	[0.001]					[0.131]	[0.030]
Domestic lenders					0.090***	0.079***			0.071***	0.056***
					[0.000]	[0.000]			[0.000]	[0.003]
Experience							0.011***	0.012***	-0.001	0.001
							[0.003]	[0.006]	[0.787]	[0.822]
Observations	2,075	2,100	2,075	2,100	2,047	2,072	2,075	2,100	2,047	2,072
R-squared	0.273	0.344	0.269	0.344	0.28	0.353	0.268	0.342	0.285	0.359

Table 3
Information and crisis transmission - Advanced countries versus emerging markets

This table shows estimations to explain the decline in cross-border lending from bank *i* to destination country *j* after the Lehman Brothers default. Table A3 in the Appendix contains definitions of all variables. Emerging markets are all countries except high-income OECD countries. Although Slovenia and South-Korea were recently reclassified as high-income countries we still consider them as emerging markets. All regressions include bank fixed effects and destination country fixed effects. We use an OLS (*Volume* and *Numbers* regressions) or a logit (*Sudden stop*) model. Standard errors are heteroskedasticity robust and clustered by bank. Coefficients are marginal effects. Robust p-values appear in brackets and ***, **, * correspond to the one, five and ten percent level of significance, respectively.

	Advanced countries														
	Volumes					**Sudden stop**					**Numbers**				
Subsidiary	0.037				-0.015	-0.179**				-0.101	0.028**				0.018
	[0.603]				[0.839]	[0.013]				[0.183]	[0.043]				[0.208]
Distance		-0.086***			-0.062**		0.140***			0.086**		-0.019**			-0.013
		[0.003]			[0.043]		[0.000]			[0.026]		[0.016]			[0.148]
Domestic lenders			0.442***		0.302*			-0.939***		-0.650***			0.104***		0.069
			[0.002]		[0.078]			[0.000]		[0.007]			[0.005]		[0.134]
Experience				0.055**	0.012				-0.120***	-0.032				0.012**	0.001
				[0.018]	[0.667]				[0.000]	[0.420]				[0.041]	[0.833]
Exposure	1.594	0.503	0.136	0.100	-0.58	-8.894	-6.851	-4.407	-3.922	-1.877	0.357	0.234	0.136	0.140	-0.088
	[0.337]	[0.789]	[0.942]	[0.957]	[0.761]	[0.120]	[0.175]	[0.284]	[0.400]	[0.625]	[0.339]	[0.523]	[0.718]	[0.712]	[0.812]
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	975	975	975	975	975	934	934	934	934	934	980	980	980	980	980
(Pseudo) R-squared	0.339	0.348	0.348	0.343	0.353	0.281	0.291	0.299	0.287	0.307	0.396	0.399	0.400	0.396	0.405
	Emerging markets														
	Volumes					**Sudden stop**					**Numbers**				
Subsidiary	0.181***				0.117*	-0.130**				-0.029	0.046***				0.036***
	[0.010]				[0.084]	[0.025]				[0.643]	[0.001]				[0.009]
Distance		-0.090**			-0.063*		0.129***			0.100***		-0.017**			-0.012
		[0.011]			[0.067]		[0.000]			[0.004]		[0.023]			[0.120]
Domestic lenders			0.326***		0.199**			-0.457***		-0.260**			0.069***		0.048*
			[0.002]		[0.040]			[0.000]		[0.021]			[0.005]		[0.056]
Experience				0.072**	0.028				-0.130***	-0.077**				0.011	0.000
				[0.018]	[0.280]				[0.000]	[0.038]				[0.121]	[0.952]
Exposure	-2.746	-3.697**	-4.007**	-3.419*	-5.416***	2.804	6.308	7.395	7.502	15.314*	-0.453	-0.585	-0.680*	-0.484	-0.907**
	[0.118]	[0.036]	[0.024]	[0.059]	[0.003]	[0.541]	[0.369]	[0.335]	[0.286]	[0.087]	[0.206]	[0.134]	[0.074]	[0.208]	[0.033]
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,107	1,107	1,081	1,107	1,081	926	926	902	926	902	1,120	1,120	1,092	1,120	1,092
(Pseudo) R-squared	0.288	0.288	0.294	0.287	0.302	0.196	0.207	0.213	0.210	0.229	0.330	0.325	0.337	0.323	0.346

We find a significant negative effect of *Distance* on lending stability, both in lending to advanced and emerging markets. Banks continued to lend more during the crisis to borrowers that are relatively close. Moreover, the probability of a full *Sudden stop* increases significantly with distance to the borrower country. As discussed, when we include both *Distance* and *Subsidiary* at the same time (last columns) *Distance* turns out to be the more robust determinant, in particular in lending to advanced countries.[9]

We thus show that distance not only has a negative impact on the amount of cross-border lending, as documented in earlier studies, but also on its stability. Banks reduced the volume of their lending to borrowers at a mean distance by 28 per cent more compared to borrowers at the minimum distance (based on the bank-fixed effects regression in the top panel of Table 2). The economic impact of *Distance* is also substantial when compared to other determinants of lending stability. A one standard deviation increase in *Distance* leads to an additional decline in lending volume of 35 per cent, whereas a one standard deviation decline in *Solvency* leads to a volume decrease of only 4 per cent (all else equal).

Next, we find for all three dependent variables that international banks that regularly cooperate with *Domestic banks* are significantly more stable sources of cross-border credit. For cross-border lending to both advanced countries and to emerging markets we find that international banks that are well-connected to domestic banks outperform less-connected banks in terms of lending stability. Our full sample results indicate that banks reduce their lending by 13 per cent less to countries where their level of cooperation with *Domestic banks* equals the mean level across our sample, compared to countries where they had not cooperated with domestic banks before the outbreak of the crisis.

Our results indicate that previous *Experience* with cross-border syndicated lending to a particular country has a positive impact on lending stability as well. Banks reduce their lending volume with 21 per cent less to countries in which they have average experience, compared to countries where their experience is very limited. This effect, however, is less strong than the impact of either cooperation with *Domestic banks* or *Distance* when looking at changes in lending volumes or in the number of loans. Just like the *Subsidiary* effect, the *Experience* effect is stronger in emerging markets, where it has a robustly negative impact on

[9] In an unreported regression, we also interact *Distance* and *Subsidiary*. *Distance* may not only have a direct negative effect on lending stability but also reduce the positive effect of the presence of a *Subsidiary* because intra-bank agency costs increase with distance (Rajan, Servaes and Zingales., 2000). Indeed, we find that in emerging markets, setting up a subsidiary is an effective tool to reduce distance-related agency costs although its effectiveness decreases with distance.

the probability of a sudden stop in lending. Banks that had built up a track record of syndicated lending over time turned out to be less fickle during the crisis.

Finally, our control variables tell some interesting stories as well (top panel Table 2). We find quite strong evidence for a negative correlation between state support and cross-border lending during the crisis, in line with an increased focus on domestic lending by supported banks. Government-supported banks reduced their cross-border lending by 9 per cent more than non-supported banks. The result holds when we include a battery of other bank-specific control variables. While this seems to confirm the anecdotal evidence on a negative causal impact of financial protectionism on cross-border lending, it may also partly reflect selection bias. Weaker banks, with the most binding balance sheet constraints and the biggest need to deleverage, were also those most in need of government support. As expected, we also find that larger and better capitalised banks were relatively stable sources of credit during the crisis, whereas banks that had to increase their liquidity during the crisis were among those that retrenched the most from foreign markets.

4.2. Robustness

Alternative calculations of dependent variables

Table 4 presents a number of robustness tests to check whether our main results are sensitive to changes in the way we calculate our three dependent variables *Volume*, *Sudden stop*, and *Numbers*. For ease of comparison, the 'Base' column replicates the baseline results as reported in Table 2 for each of these variables. First, the 'Cut-off 99 pct' columns show regressions where we define and remove outliers in the dependent variable that are above the 99th percentile (so far we have excluded observations above the 97th percentile).[10] Changing this cut-off does not materially affect our results.

Next, the '1-year change' columns show regressions where we define the decline in cross-border lending by comparing the volume (or number) of loans over the 12-month period of October 2008-September 2009 to the volume (or number) of loans over the 12-month period of August 2006-July 2007. This differs from our baseline definition where we compare average monthly lending volumes (numbers) over the post-Lehman period with average monthly lending volumes (numbers) over a longer pre-crisis period: January 2005-July 2007. For the *Sudden stop* variable the '1 year change' regression means that the dummy becomes

[10] This robustness test is not applicable to the *Sudden stop* regressions.

one when the decline in the 1-year lending volume is more than 75 per cent. Our results again remain virtually unchanged.

For the *Sudden stop* variable we also run regressions where we define a *Sudden stop* as a complete stop in lending, i.e. zero loans in the post-Lehman period ('Extensive margin' column). Table 4 shows that our results are robust to this change.

Finally, we recalculate the dependent variables that measure changes in loan volumes (*Volume* and *Sudden stop*) on the basis of three different loan allocation rules. As mentioned in Section 3.1, Loan Analytics only provides information on the exact loan breakdown for about 25 per cent of all loans. So far we have used a rather simple rule to distribute the other 75 per cent of the loans over their respective syndicate members: we assumed that each lender provided the same amount of money. To minimise the risk that we introduce a significant measurement error by choosing a particular distribution rule, we recalculate our dependent variable using three alternative methods.[11]

The 'Alternative rule' columns show regressions where the dependent variable is calculated on the basis of a different rule. The information from Loan Analytics shows that about 50 per cent of a typical loan is distributed to participants (junior banks), whereas the other half is retained by loan arrangers (senior banks). We therefore allocate half of each loan to the arrangers and half to the participants and further subdivide these loan portions within the arranger and participant groups on an equal basis. This alternative calculation leaves our main results unchanged.

Next, we go one step further and use the 25 per cent of our sample for which we have full information to estimate a model in which the loan amount of individual lenders is the dependent variable. As explanatory variables we use the average loan amount (total loan amount divided by the number of lenders in the syndicate), a dummy that indicates whether a lender is an arranger or a participant, an interaction term between this arranger dummy and a variable that measures whether the borrower is a repeat borrower or not, an interaction term between the arranger dummy and a post-Lehman time dummy, and a set of bank and country dummies.

[11] Simply using the 25 per cent of the loan population for which we have breakdown information would introduce a measurement error in the dependent variables *Volume* and *Sudden stop*. When constructing the lending flows from bank *i* to country *j* we would need to assume that the loan amount is zero for the loan shares that are missing, which obviously is incorrect. Because the availability of loan allocation information is more or less random, this problem would extend to all bank-country pairs.

Table 4
Information and crisis transmission - Robustness checks

This table shows the results of various robustness tests for our baseline regressions to explain the decline in cross-border lending from bank *i* to destination country *j* after the Lehman Brothers default. Table A3 in the Appendix contains definitions of all variables. The 'Base' columns replicate the baseline results from Table 2. The 'Cut-off 99 pct' columns show regressions where we exclude outliers above the 99th instead of the 97th percentile of the dependent variable. The '1 year change' columns show regressions where we compare the 12 months after the Lehman collapse with the 12 month pre-crisis period July 2006-August 2007. The 'Alternative rule' columns show regressions where the dependent variable is calculated on the basis of a rule where half of the loan is allocated to MLAs and half to the participants. Within each of these two lender groups the loan is divided equally. The 'Model' columns show regressions where the allocation of the loans over the syndicate members is based on predicted values from a regression model. The 'Extreme distribution' columns show regressions where the dependent variable is based on an allocation rule where one randomly chosen lender receives (almost) all of the loan whereas the other lenders receive only 1 per cent of the total loan amount each. The 'Extensive margin' column shows regressions where the sudden stop is defined as a complete stop in lending (zero loans in the post-Lehman period). All regressions include bank fixed effects and destination country fixed effects. We use an OLS *(Volume* and *Numbers* regressions) or a logit (*Sudden stop*) model. Coefficients are marginal effects. Standard errors are heteroskedasticity robust and clustered by bank. Robust p-values appear in brackets and ***, **, * correspond to the one, five and ten percent level of significance, respectively.

	Volume						**Sudden stop**						**Numbers**		
	Base	**Cut-off 99 pct**	**1 year change**	**Alterna-tive rule**	**Model**	**Extreme distribution**	**Base**	**1 year change**	**Extensive margin**	**Alterna-tive rule**	**Model**	**Extreme distribution**	**Base**	**Cut-off 99 pct**	**1 year change**
Subsidiary	0.056	0.095*	0.098**	0.071	0.049	0.040	-0.053	-0.033	-0.079	-0.068	-0.078*	-0.048	0.024***	0.037***	0.054**
	[0.210]	[0.099]	[0.044]	[0.155]	[0.320]	[0.416]	[0.226]	[0.453]	[0.116]	[0.116]	[0.056]	[0.269]	[0.007]	[0.002]	[0.028]
Distance	-0.048**	-0.079***	-0.083***	-0.060***	-0.047**	-0.104***	0.072***	0.053**	0.071***	0.078***	0.077***	0.059***	-0.010**	-0.011**	-0.025
	[0.016]	[0.002]	[0.001]	[0.003]	[0.022]	[0.000]	[0.002]	[0.017]	[0.003]	[0.000]	[0.000]	[0.001]	[0.030]	[0.043]	[0.113]
Domestic banks	0.264***	0.274**	0.228**	0.310***	0.251***	0.077	-0.360***	-0.357***	-0.242**	-0.342***	-0.368***	-0.226**	0.056***	0.058***	0.147**
	[0.002]	[0.018]	[0.013]	[0.001]	[0.008]	[0.499]	[0.000]	[0.000]	[0.031]	[0.002]	[0.000]	[0.024]	[0.003]	[0.010]	[0.019]
Experience	0.014	-0.006	0.011	-0.007	0.01	0.022	-0.054**	-0.070***	-0.143***	-0.057**	-0.055**	-0.03	0.001	-0.001	0.015
	[0.379]	[0.810]	[0.655]	[0.727]	[0.588]	[0.311]	[0.018]	[0.005]	[0.000]	[0.014]	[0.015]	[0.120]	[0.822]	[0.822]	[0.316]
Exposure	-2.771**	-3.893**	-5.749***	-3.725**	-2.527*	-2.320*	0.447	3.690*	1.812	0.992	0.873	-1.33	-0.289	-0.29	-1.700*
	[0.048]	[0.017]	[0.002]	[0.012]	[0.078]	[0.096]	[0.835]	[0.084]	[0.389]	[0.629]	[0.700]	[0.333]	[0.279]	[0.422]	[0.051]
Observations	2,056	2,097	1,896	2,054	2,052	2,056	1,934	1,809	2,077	1,921	1,924	1,913	2,072	2,099	1,915
(Pseudo) R-squared	0.280	0.245	0.257	0.256	0.265	0.201	0.255	0.260	0.287	0.260	0.258	0.232	0.359	0.334	0.318

We then use the estimated coefficients to predict the loan amount of individual lenders in the 75 per cent of the sample where we do not know the actual amounts (we replace negative predicted values with zero and predicted values exceeding the total loan amount with this amount). The results in Table 4 show again that our results are very robust.

Finally, we apply an allocation rule where each lender receives just one per cent of the loan amount with the exception of one randomly chosen lender that receives the rest of the loan ('Extreme distribution' columns in Table 4). Even in this case our results continue to hold, although the *Domestic banks* and *Experience* coefficients are estimated imprecisely in the *Volume* and *Sudden stop* regressions, respectively. This is due to the fact that this 'extreme' allocation rule probably introduces the most noise in the approximation of the 'true' loan amounts. When we apply the various rules to the 25 per cent of our sample for which we actually know the loan distribution, we find that the average deviation from the true loan amount is 29 per cent for the simple rule, 33 per cent for the alternative rule, 47 per cent for the model-based allocation, and 90 per cent for the extreme distribution rule.

In sum, Table 4 shows that our results are robust to changes in the calculation method for our dependent variables. As before, we find a strong negative effect of distance on lending stability in terms of loan volume and number of loans and a positive impact on the probability of a (full) *Sudden stop*. In addition, the level of cooperation with domestic banks continues to have a positive impact on cross-border lending stability. Finally, we continue to find that banks with a track record and experience in lending to particular countries were less likely to completely stop lending to these countries in the aftermath of the Lehman Brothers collapse.

Distance: geography, culture, or institutions?

The regressions in Tables 2 and 3 provide robust evidence for a negative relationship between geographical distance and cross-border lending stability. However, the collection and transmission of borrower information from the destination country to a bank's headquarters may also be impaired by cultural and institutional differences between the home and destination country. For instance, notwithstanding the large geographical distance involved, Spanish banks may have kept up their syndicated lending to Mexican firms quite well during the crisis because the cultural and historical ties between both countries made Spanish banks more at ease in dealing with Mexican clients than with borrowers in, say, Turkey (which is closer in geographical than cultural terms). Similarly, banks may feel more confident – in

particular during a crisis – when lending to firms in countries where the institutional and legal environment resembles that in their home country.

To look into the relative importance of geographical, cultural, and institutional distance in more detail, we analyse the impact of a number of non-geographical distance measures on lending stability. These include a dummy variable that indicates whether the bank's home country and the destination country share a common language, a dummy that indicates whether both countries share colonial links, a variable that measures the absolute difference between both countries in the Doing Business credit information index (which measures rules affecting the scope, access and quality of credit information), and a dummy that indicates whether the origin of the legal system of both countries differs.

Table 5
Distance and crisis transmission

This table shows estimations to explain, using different distance measures, the decline in cross-border lending from bank *i* to destination country *j* after the Lehman Brothers default. The dependent variable is *Sudden stop*. Table A3 in the Appendix contains definitions of all variables. Regressions include bank-fixed effects and destination country-fixed effects. We use a logit model with standard errors that are heteroskedasticity robust and clustered by bank. Coefficients are marginal effects. Robust p-values appear in brackets and ***, **, * correspond to the one, five and ten per cent level of significance, respectively.

	All countries								
Distance	0.053**		0.046**		0.054**		0.055**		0.051**
	[0.017]		[0.044]		[0.016]		[0.012]		[0.024]
Common language		-0.128**	-0.102*						
		[0.026]	[0.077]						
Colonial links				-0.050	-0.056				
				[0.498]	[0.443]				
Credit info						-0.021	-0.024		
						[0.297]	[0.212]		
Legal difference								0.065*	0.058
								[0.067]	[0.105]
Subsidiary	-0.033	-0.035	-0.028	-0.043	-0.033	-0.046	-0.036	-0.039	-0.030
	[0.453]	[0.431]	[0.533]	[0.322]	[0.455]	[0.294]	[0.417]	[0.374]	[0.500]
Domestic banks	-0.357***	-0.383***	-0.359***	-0.381***	-0.350***	-0.382***	-0.351***	-0.374***	-0.348***
	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]
Experience	-0.070***	-0.082***	-0.071***	-0.083***	-0.070***	-0.085***	-0.072***	-0.082***	-0.070***
	[0.005]	[0.001]	[0.005]	[0.001]	[0.006]	[0.001]	[0.005]	[0.001]	[0.006]
Exposure	3.690*	3.727*	3.953*	3.309	3.684*	3.125	3.474	3.593*	3.910*
	[0.084]	[0.082]	[0.067]	[0.119]	[0.084]	[0.144]	[0.106]	[0.089]	[0.066]
Observations	1,809	1,809	1,809	1,809	1,809	1,809	1,809	1,809	1,809
Pseudo R-squared	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26

In Table 5 we add these alternative distance measures one-by-one to our baseline regression; in each case first alone, and then together, with our geographical distance measure to see how they affect the coefficient of the latter. We only show the regressions for the dependent

variable *Sudden stop*. Results for *Amount* and *Numbers* are very similar and available upon request. It becomes clear that geographical distance is a very robust determinant of lending stability. The variable is only 'challenged' by the dummy that measures whether the bank's home country and the destination country share a common language. This cultural proxy has a significant negative effect on the probability of a *Sudden stop*: lending flows between culturally similar countries are more resilient. However, even when we add this variable together with *Distance*, the coefficient of the latter stays statistically highly significant and displays only a marginal reduction in economic significance.

Finally, the institutional distance variables *Colonial links*, *Credit info* and *Legal difference* do not have a strong independent impact on lending stability and hardly affect the coefficient of *Distance* in a bilateral 'horse race'. Note that the coefficient for *Legal difference* is significant at the 10 per cent level and has the right sign: the probability of a *Sudden stop* in lending is higher in case the bank's home country and the destination country have different legal origins. In summary, we conclude that geographical distance is what matters for lending stability: during a crisis banks continue to lend more to borrowers that are physically closer.

4.3. Extensions

Borrower heterogeneity

The extent to which banks reduced their cross-border lending during the crisis may not only have differed across destination countries, but also across borrower groups within these countries. In this sub-section we first analyse whether there has been a differentiated crisis impact on cross-border lending to first-time borrowers and to repeat borrowers. We define first-time borrowers as borrowers that had never borrowed from bank *i* before the collapse of Lehman Brothers, whereas repeat borrowers are borrowers to whom bank *i* had lent at least once. Successful prior loans and the associated borrower reputation can attenuate information asymmetries between lenders and their borrower (Diamond, 1991 and Gorton and Pennachi, 1995). De Haas and Van Horen (2010) find that arrangers of syndicated loans need to retain less in the case of loans to repeat borrowers and that retention rates for loans to such borrowers needed to increase less during the 2008-2009 financial crisis. If loans to repeat borrowers are plagued by fewer agency problems, we expect that the information variables we use in our analysis will have less of an impact on the reduction in cross-border lending to such borrowers.

Table 6
Crisis transmission and borrower heterogeneity

This table summarizes estimations to assess whether the determinants of cross-border lending stability after the Lehman Brothers default differ for lending to repeat versus first-time borrowers and for lending to banks versus non-bank borrowers. The dependent variable is *Sudden stop* . Table A3 in the Appendix contains definitions of all variables. The first set of regressions is estimated on the basis of a dataset that contains two observations for each bank i-country j pair: one where the dependent variable is a dummy that indicates whether there was a sudden stop in lending from bank i to first-time borrowers in country j and one where the dependent variable is a dummy that indicates whether there was a sudden stop in lending from bank i to repeat borrowers in country j. First-time borrowers are borrowers that had never borrowed from bank i before the collapse of Lehman Brothers whereas repeat borrowers are borrowers to whom bank i had lent at least once. The second set of regressions is also estimated on the basis of a dataset that contains two observations for each bank i-country j pair: one where the dependent variable is a dummy that indicates whether there was a sudden stop in lending from bank i to banks in country j and one where the dependent variable is a dummy that indicates whether there was a sudden stop in lending from bank i to non-bank borrowers in country j. The interaction variables interact the main independent variables with the dummy that identifies first-time borrowers (first set of regressions) or non-bank borrowers (second set). All regressions include country fixed effects and bank fixed effects that are allowed to vary between repeat vs. first-time borrowers and between bank vs. non-bank borrowers, respectively. We use a logit model where standard errors are heteroskedasticity robust and clustered by bank. Coefficients are marginal effects. Robust p-values appear in brackets and ***, **, * correspond to the one, five and ten percent level of significance, respectively.

All countries									
	Repeat vs first-time borrowers					**Bank vs non-bank borrowers**			
	X→ *Subsidiary*	*Distance*	*Dom. lenders*	*Experience*		X→ *Subsidiary*	*Distance*	*Dom. lenders*	*Experience*
X	-0.084**	0.097***	-0.498***	-0.106***	X	0.139*	0.024	-0.121	-0.021
	[0.027]	[0.000]	[0.000]	[0.000]		[0.060]	[0.541]	[0.354]	[0.437]
X*First-time	0.002	0.001	0.079	-0.043**	X*Non-bank	0.294***	0.065**	-0.342***	-0.066***
	[0.958]	[0.969]	[0.404]	[0.022]		[0.002]	[0.040]	[0.010]	[0.003]
First-time	0.152***	0.150	0.128***	0.297***	Non-bank	-0.298***	-0.581***	-0.263***	-0.190***
	[0.000]	[0.302]	[0.009]	[0.000]		[0.000]	[0.001]	[0.000]	[0.009]
Exposure	-3.622*	-2.263	-1.446	0.616	Exposure	-2.629*	-1.033	-0.644	-0.349
	[0.087]	[0.218]	[0.399]	[0.702]		[0.065]	[0.486]	[0.629]	[0.837]
Observations	2,681	2,681	2,659	2,681	Observations	2,213	2,213	2,190	2,213
Pseudo R-squared	0.22	0.23	0.23	0.24	Pseudo R-squared	0.26	0.26	0.27	0.26

The left-hand side of Table 6 shows estimation results for a regression model that allows for a differential impact of our information variables on repeat and first-time borrowers. As in Table 5 the dependent variable is *Sudden stop*.[12] The regressions are estimated on the basis of a dataset that contains two observations for each bank *i*-country *j* pair: one where the dependent variable is a dummy that indicates whether there was a *Sudden stop* in lending from bank *i* to first-time borrowers in country *j,* and one where the dependent variable is a dummy that indicates whether there was a *Sudden stop* in lending from bank *i* to repeat borrowers in country *j*. The interaction terms interact the main independent variables with the dummy that identifies first-time borrowers.

The first line confirms our earlier results: the probability of a *Sudden stop* is lower in case a bank has a subsidiary in a country, is geographically closer to the country, is well-integrated into a network of domestic borrowers and has previous experience in the country. The second line indicates that these effects are similar for first-time and repeat borrowers with the exception of *Experience*, which is particularly important for lending to first-time borrowers.

[12] The results are again similar when using the other two dependent variables (results available upon request).

Finally, the third line shows that, as expected, the probability of a *Sudden stop* was significantly higher for lending flows to first-time borrowers (all else equal).[13]

The right-hand side of Table 6 shows similar regressions for cross-border lending flows to bank versus non-bank borrowers. Also in this case the dataset contains two observations for each bank *i*-country *j* pair: one where the dependent variable is a dummy that indicates whether there was a *Sudden stop* in lending from bank *i* to banks in country *j,* and one where the dependent variable is a dummy that indicates whether there was a *Sudden stop* in lending from bank *i* to non-bank borrowers in country *j*.[14] The interaction terms interact the main independent variables with the dummy that identifies non-bank borrowers.

Compared to other sectors, banks are intrinsically difficult to screen and monitor since they themselves are delegated monitors of a portfolio of sub-projects (Diamond, 1984). Agency problems in inter-bank lending are difficult to resolve as there is not one (physical) project or factory that a potential lender can visit and inspect. Due diligence of a bank borrower is a more onerous process that deals with assessing the bank's risk and operational systems as well as the quality of a sample of the loan book. Banks' high leverage exacerbates these agency problems (Morgan, 2002). During the crisis short-term inter-bank lending virtually dried up in many countries and the extreme rise in uncertainty and information asymmetries in lending between banks also had repercussions for longer-term lending between banks.

The results in Table 6 indicate that none of the mechanisms that banks successfully used to limit information costs during the crisis – country-specific experience, relationships with domestic co-lenders, and (to a lesser extent) a local subsidiary – helped to contain the crunch in inter-bank cross-border syndicated bank lending. Agency problems and mistrust in the inter-bank market were simply too large for banks to mitigate them in any meaningful way. The third line shows that the probability of a *Sudden stop* in cross-border lending was, as expected, significantly larger for banks than for non-banks.

[13] The finding that access to borrower information is important for both lending to first-time and to repeat borrowers shows that our baseline results do not merely reflect a crisis-related shift to repeat borrowers (who are likely to be concentrated in countries where a bank owns a subsidiary, that are close, and where the bank has cooperated with domestic banks and has built up lending experience more generally).

[14] Because not all banks lend to both groups in each country in the pre-crisis period, the number of observations in this regression is less than twice the number of observations in the baseline regression in Table 2.

Arrangers versus participants

A typical syndicate consists of two tiers: arrangers and participants. The arrangers comprise the senior tier and negotiate the lending terms with the borrower, who gives the arrangers a mandate to structure and market the loan. Arrangers then allocate a substantial part of the loan to a junior tier, the participants, who assume a more passive role. Participants are usually not actively involved in the organisation of the loan or in the screening and monitoring of the borrower. Mechanisms to deal with information problems may therefore have been particularly important for arrangers and our results may consequently be driven by banks that typically act in an arranger role.

To see whether this is the case, we rerun our baseline regressions while including a variable *Arranger* that measures for each bank the percentage of pre-crisis loans in which it acted as a mandated lead arranger or book runner, rather than as a participant. We interact our main information variables – *Distance*, *Subsidiary*, *Domestic banks*, and *Experience* – with *Arranger*. We find no significant differences between both tiers of syndicate members. This suggests that even for banks that more or less passively buy into a syndicated loan, it matters whether it has lending experience in a country, whether the country is distant or not, whether it has been lending together with domestic banks, and whether – in the case of emerging markets – it owns a subsidiary in that country.

Impact on loan maturity and spreads

The sudden stop in cross-border bank lending may not only have manifested itself in a reduced availability of credit, but also in higher lending rates and/or a reduction in maturities for those loans that did go ahead. Lending rates may have gone up especially where banks found it difficult to assess the increase in risks in the wake of the Lehman Brothers collapse.[15] Likewise, banks may have shortened maturities in particular in countries where they experienced more difficulties in stepping up their screening efforts. Theory suggests that lending at short maturities may reduce moral hazard and other debt-related agency problems (Barnea, Haugen and Senbet, 1980; Rey and Stiglitz, 1993).

To look into this, we estimate regressions where our dependent variables are the change in the average *Spread* charged by bank *i* to borrowers in country *j* and the change in the average *Maturity* of loans by bank *i* to country *j*, respectively. *Spread* measures the spread over Libor

[15] Lending rate increases will nevertheless be constrained by concerns about moral hazard. Note that our country-fixed effects control for the change in country risk, which allows us to focus on how different banks behave differently within a certain country.

(or other relevant reference rate). We find no robust evidence of an impact of any of our information variables on the average change in maturity or spreads. One interesting and clear exception is the positive impact of *Experience* on spreads, both in emerging markets and developed countries (significant at the 5 per cent level in both sub-sample regressions and at the 1 per cent level in a regression for all countries). Banks with more lending experience in a country are more inclined to continue to lend but this commitment – and the reduction in competitive pressures due to other lenders leaving the market – comes at the cost of higher lending rates.

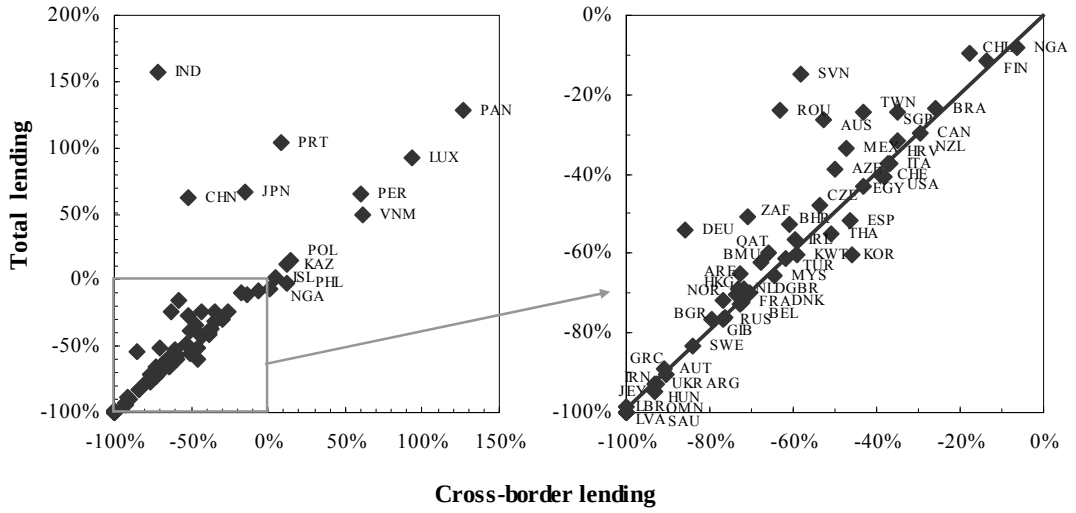
Cross-border versus domestic syndicated lending

Because international banks were more inclined to keep lending to some countries than to others, we document substantial variation in the severity of the sudden stop after the collapse of Lehman Brothers (Figure 1). While a full analysis of the impact of the sudden stop on destination countries is beyond the scope of this paper, Figure 2 illustrates that most countries were unable to offset the decline in cross-border lending through increasing domestic syndicated lending.

Figure 2

A comparison of cross-border and total syndicated lending

This figure compares the change in cross-border syndicated lending to a country (horizontal axis) with the change in total syndicated lending (cross-border plus domestic syndicated lending) in that country. Lending change is the percentage change in average monthly lending in the post-Lehman compared to the pre-crisis period. The pre-crisis period is defined as January 2005 to July 2007 and the post-Lehman period as October 2008 to October 2009. The left-hand pane shows all 60 destination countries included in our dataset whereas the right-hand pane zooms in on those countries that experienced a *decline* in both cross-border and total syndicated lending. Countries that experienced a percentage change in domestic lending that was exactly equal to the percentage change in cross-border lending are on the 45º line. Countries where domestic lending shrank faster (slower) than cross-border lending are to the right (left) of this line.



The left-hand pane shows that there were only a few countries – India, China, Japan – where increased lending by (often state-owned) banks more than compensated for the severe drop in cross-border inflows. The right-hand pane shows that most countries experienced a decline in total syndicated lending very similar to the decline in cross-border syndicated lending (observations on the 45º line). Domestic lending was unable to cushion much of the decline in credit from abroad. Only a few countries –Germany, South Africa, Taiwan – partially counterbalanced reduced inflows with increased domestic lending. This imperfect substitutability between cross-border and domestic syndicated loans implies that the results we document in this paper are likely to have had severe consequences for the total lending supply in the destination countries.

5. Conclusion

We use a detailed dataset on cross-border bank lending to analyse to what extent mechanisms to mitigate information costs enable banks to limit their decrease in cross-border lending during a crisis. We employ country- and bank-fixed effects to rigorously control for changes in credit demand and other confounding factors, instead focusing on the impact of information variables on the stability of lending by specific banks to borrowers in specific countries. In line with our theoretical priors, we find a strong and robust negative effect of geographical distance on lending stability, both in lending to advanced and to emerging markets. Distant borrowers are not only more difficult to screen and monitor in general, but their creditworthiness is also particularly difficult to assess during a crisis.

An effective way for banks to (partially) offset the impact of distance is to cooperate with domestic banks. We find that during the global financial crisis banks were better able to keep lending to countries in which they are well integrated into a network of domestic co-lenders. Likewise, banks also remained more committed to lend to countries in which they had gained experience by building relationships with (repeat) borrowers. Banks that have built up a track-record of syndicated lending to a particular country turn out to be less fickle during a crisis. Track records matter on the side of borrowers too: the sudden stop was particularly severe in the case of lending flows to first-time borrowers. Finally, we find that in the case of cross-border lending to emerging markets, where trustworthy 'hard' information – such as accounting reports – may be less readily available, the presence of a local subsidiary also stabilises cross-border lending.

To sum up, our findings paint a more nuanced picture than the black-and-white dichotomy of transaction-based lending by large banks versus relationship lending by small banks. We show that even in a sample of the largest international banks that provide loans to large companies, access to 'soft' information – gathered through repeat lending and interaction with domestic banks – is important.

Our results clearly bear on the policy debate on financial globalisation and in particular on whether and how countries should integrate their banking systems with global financial markets. A key feature of cross-border lending that has been a focus of debate, and further underlined by the recent crisis, is its unstable character (for instance compared to lending by domestic banks or foreign bank subsidiaries). Our results provide some first answers to the question of when cross-border lending is particularly volatile and when it is not. Perhaps somewhat controversially, we find that banks that are further away from their customers are

less reliable funding sources during a crisis. Clearly, policy-makers not only need to make a decision on whether to open up their banking system but also to whom.

A second finding is that international banks with a local presence on the ground may be more stable providers of credit. For emerging markets that are considering to open up their banking system this implies that stimulating banks to 'set up shop' may kill two birds with one stone. Not only do foreign bank subsidiaries provide for a relatively stable credit source themselves, but their presence may also stabilise the cross-border component of bank lending. Rather than imposing capital controls to reduce the volatility of cross-border lending, countries may thus contemplate allowing international banks to also set up a local affiliate.

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Appendix Table A1

List of international lenders

This table lists all 118 banks in our sample, ordered by country of incorporation. *Pre-crisis* refers to the period January 2005-July 2007 and *post-Lehman* to the period October 2008-October 2009. *Share of cross-border in total lending* measures the volume of cross-border syndicated lending of the bank divided by the total volume of syndicated lending by that bank (in percent). *Volume of cross-border lending* measures the total volume of cross-border syndicated lending by the bank in US dollar millions. *Number of cross-border loans* measures the number of cross-border syndications the bank took part in. *Market share* measures the market share of the bank in 2006 in the global market for cross-border syndicated lending (in percentage points).

		Share of cross-border in total lending (percent)		Volume of cross-border lending (USD m)		Number of cross-border loans		Market share (ppts.)
	Name	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis
Australia	National Australia Bank	55	31	21,082	2,507	266	51	0.44
Australia	ANZ	36	43	15,114	5,388	231	80	0.26
Australia	Commonwealth Bank of Australia	33	23	10,507	2,437	141	32	0.25
Australia	Westpac	30	17	10,323	1,729	125	35	0.23
Austria	RZB	94	97	18,504	4,196	783	55	0.38
Austria	Erste Group Bank AG	96	96	9,754	927	482	21	0.26
Austria	Hypo Alpe-Adria-Bank	99	100	1,089	133	48	2	0.05
Austria	Oesterreichische Volksbanken AG	93	90	1,861	198	64	6	0.03
Austria	BAWAGPSK	88	100	1,190	187	89	3	0.03
Bahrain	Gulf International Bank BSC	97	100	5,924	75	111	1	0.14
Bahrain	Arab Banking Corp - BSC	94	100	4,787	302	100	8	0.09
Belgium	Fortis	85	80	77,901	8,732	1,269	149	1.53
Belgium	KBC	87	85	31,153	3,786	646	62	0.62
Belgium	Dexia	91	93	18,830	4,042	180	53	0.57
Canada	Scotia Capital	72	68	65,979	17,694	805	200	1.26
Canada	BMO Capital Markets	65	51	33,341	7,926	718	152	0.74
Canada	RBC Capital Markets	63	55	38,825	9,260	376	110	0.67
Canada	TD Securities Inc	51	56	18,785	8,225	312	138	0.36
Canada	CIBC World Markets	44	9	13,538	615	166	19	0.25
China	Bank of China Ltd	87	73	21,422	8,630	505	68	0.48
China	Industrial & Commercial Bank of China	89	52	6,197	2,201	225	42	0.15
China	Bank of Communications Co Ltd	88	32	3,329	512	102	18	0.09
China	China Construction Bank Corp	72	33	3,577	723	159	20	0.08
China	China Merchants Securities Co Ltd	90	33	3,646	431	59	16	0.06
China	Agricultural Bank of China	71	9	1,574	137	69	6	0.03
China	CITIC Group	68	52	1,187	578	78	14	0.02
Denmark	Danske Bank	86	78	25,299	5,072	406	39	0.65
Egypt	National Bank of Egypt	75	100	1,306	174	126	2	0.04
France	BNP Paribas	78	85	213,787	45,450	2,359	474	5.10
France	Calyon	69	76	136,839	28,928	1,681	358	2.86
France	SG Corporate & Investment Banking	73	82	112,182	25,394	1,341	293	2.62
France	Natixis	55	70	50,563	10,147	960	168	1.22
France	Banque Federative du Credit Mutuel	46	68	18,209	5,637	269	52	0.38
France	CASDEN Banque Populaire	40	16	2,415	94	64	4	0.12
Germany	Deutsche Bank	91	91	252,748	36,460	1,464	290	5.44
Germany	Commerzbank Group	71	72	125,951	16,476	1,792	152	3.13
Germany	DZ Bank	79	59	21,911	4,762	478	59	0.50
Germany	NordLB	74	67	9,852	2,028	301	32	0.17
Germany	WGZ	60	7	1,333	20	146	2	0.03
Greece	Alpha Bank	62	100	2,405	23	185	1	0.07
Greece	National Bank of Greece	64	96	1,919	496	178	21	0.03
Hong Kong	Bank of East Asia	64	73	2,104	614	131	22	0.05
Hong Kong	Iyo Finance (Hong Kong) Ltd	100	100	1,044	513	197	55	0.03
India	SBI Capital Markets Ltd	60	11	3,016	1,475	190	27	0.06

Appendix Table A1- cont'd

		Share of cross-border in total lending (percent)		Volume of cross-border lending (USD m)		Number of cross-border loans		Market share (ppts.)
	Name	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis
India	ICICI Bank	69	67	1,954	562	91	7	0.04
Ireland	Bank of Ireland	91	94	25,197	3,848	486	62	0.54
Ireland	Allied Irish Banks plc	92	95	25,778	2,454	561	51	0.53
Israel	Bank Hapoalim BM	100	100	3,490	48	149	2	0.09
Israel	Bank Leumi Le-Israel BM	100	100	2,191	329	63	13	0.06
Israel	Israel Discount Bank Ltd	100	100	1,338	403	69	13	0.04
Italy	UniCredit Group	83	87	86,313	11,476	1,582	143	1.78
Italy	Intesa Sanpaolo	66	74	41,266	10,448	763	102	0.93
Italy	Monte dei Paschi	70	15	8,112	419	208	13	0.11
Italy	Gruppo Banco Popolare di Verona e Novara	51	1	3,180	16	117	1	0.05
Japan	Mitsubishi UFJ Financial Group	67	38	174,833	39,457	2,243	544	3.44
Japan	Mizuho	52	21	100,243	14,541	1,557	167	2.33
Japan	Sumitomo Mitsui Financial Group, Inc	45	19	78,368	15,660	1,364	211	1.54
Japan	Nomura	100	53	24,087	272	113	6	0.58
Japan	Norinchukin Bank Ltd	22	5	3,012	389	64	10	0.05
Jordan	Arab Bank Group	100	100	7,361	731	150	11	0.16
Luxembourg	BCEE	86	17	1,750	25	86	1	0.03
Macao	Tai Fung Bank Ltd	100	100	2,694	175	48	3	0.08
Malaysia	Maybank Investment Bank Bhd	93	83	3,070	536	156	17	0.08
Malaysia	CIMB Group	45	62	1,024	266	89	6	0.02
Netherlands	ING	86	84	98,876	15,820	1,418	204	1.99
Netherlands	Rabobank	78	75	33,342	6,723	659	132	0.73
Netherlands	NIBC Bank	63	43	3,693	481	83	12	0.09
Norway	DnB NOR Bank ASA	63	57	24,295	2,666	308	41	0.56
Oman	Bank Muscat SAOG	64	100	958	11	76	1	0.02
Portugal	Caixa Geral de Depositos SA - CGD	95	57	7,667	1,928	185	25	0.21
Portugal	Banco Espirito Santo de Investimento	94	57	5,686	1,352	117	29	0.17
Portugal	Banco BPI	93	22	2,347	253	60	5	0.11
Qatar	Qatar National Bank	56	15	1,904	45	56	3	0.04
Qatar	Commercial Bank of Qatar QSC	47	0	661	0	51	0	0.02
Qatar	Doha Bank QSC	65	19	568	36	55	3	0.01
Singapore	DBS	85	68	14,064	3,195	398	93	0.29
Singapore	UOB	86	48	9,678	1,137	282	33	0.24
Singapore	Oversea-Chinese Banking Corp Ltd	69	46	4,189	1,106	182	32	0.15
South Africa	Standard Bank	88	100	4,993	1,205	227	21	0.11
Spain	BBVA	79	77	55,402	18,017	781	217	1.50
Spain	Banco Santander SA	64	66	46,243	16,121	660	163	0.98
Spain	Caja Madrid	55	48	14,825	3,503	114	19	0.34
Sweden	Nordea Bank AB	84	88	40,912	7,206	451	75	1.09
Sweden	SEB	67	79	20,001	4,510	248	41	0.46
Sweden	Svenska Handelsbanken AB	76	91	17,383	3,389	163	33	0.39
Sweden	Swedbank Markets	51	53	3,722	626	105	8	0.10
Switzerland	Credit Suisse	97	93	167,344	23,598	1,083	155	3.59
Switzerland	UBS	97	87	106,681	18,008	854	160	2.31
Taiwan	First Commercial Bank Co Ltd	72	63	4,731	1,363	183	24	0.13
Taiwan	Chang Hwa Commercial Bank Ltd	72	42	4,544	954	190	33	0.13
Taiwan	Mega International Commercial Bank	59	53	5,564	966	276	34	0.11
Taiwan	Bank of Taiwan	52	51	3,000	690	170	20	0.08
Taiwan	Hua Nan Commercial Bank Ltd	53	26	2,351	301	144	13	0.05
Taiwan	Cathay United Bank Co Ltd	28	14	1,051	116	83	10	0.04
Taiwan	Fubon Financial Holding Co Ltd	27	25	1,158	364	70	14	0.03
Taiwan	Taiwan Cooperative Bank	30	15	1,085	178	62	11	0.03

Appendix Table A1- cont'd

		Share of cross-border in total lending (percent)		Volume of cross-border lending (USD m)		Number of cross-border loans		Market share (ppts.)
	Name	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis
Taiwan	Shanghai Commercial & Savings Bank	47	3	1,184	11	81	2	0.02
Taiwan	Chinatrust Commercial Bank	23	47	1,098	661	65	24	0.01
Thailand	Bangkok Bank Ltd	86	31	1,024	68	94	8	0.03
Turkey	Turkiye Garanti Bankasi AS	100	100	1,123	29	103	2	0.02
UAE	Mashreqbank PSC	73	44	2,853	113	147	3	0.04
UAE	Emirates NBD PJSC	42	20	2,042	112	155	2	0.04
UK	RBS / ABN AMRO	77	79	360,862	44,010	2,930	445	8.33
UK	Barclays Capital	78	81	247,708	33,772	1,604	254	4.69
UK	HSBC	78	86	144,716	34,130	1,978	422	2.76
UK	Lloyds Banking Group	51	60	61,802	11,597	871	122	1.43
UK	Standard Chartered Bank	92	89	40,274	8,967	977	170	1.00
UK	NM Rothschild	88	100	2,188	7	60	1	0.03
US	Citi	48	36	234,311	30,775	1,646	195	4.85
US	JPMorgan	27	18	145,908	17,519	788	118	3.18
US	Goldman Sachs	52	24	76,400	6,302	204	21	1.47
US	Bank of America - Merrill Lynch	15	11	78,935	9,297	692	119	1.41
US	Morgan Stanley	49	22	58,251	4,113	210	35	1.12
US	GE Capital Markets Inc	24	28	18,074	3,043	275	30	0.47
US	Wells - Wachovia Securities	7	5	18,339	2,051	371	40	0.34
US	Bank of New York Mellon Corp	6	7	5,035	749	171	17	0.11
US	Comerica Bank	13	8	3,664	456	67	14	0.08
US	PNC Bank NA	37	22	25,992	3,763	764	120	0.05

Appendix Table A2
Overview of destination countries

This table lists all 60 destination countries in our sample. Pre-crisis refers to the period January 2005-July 2007 and post-Lehman to the period October 2008-October 2009. *Volume of cross-border lending* measures the total volume of cross-border syndicated lending to the country by the banks in our sample in US dollar millions. *Number of cross-border loans* measures the number of cross-border loans to the country in which at least one of the banks in our sample was active. *Number of cross-border loan portions* measures the total number of individual loan portions provided by the banks in our sample to the country (e.g. one loan with 5 lenders of which 3 foreign lenders implies three loan portions). *Number of active banks* measures the number of different banks that were at least 3 times active as cross-border lenders in the country in the pre-crisis period.

Country	Volume of cross-border lending (USD m)		Number of cross-border loans		Number of cross-border loan portions		Number of active banks	
	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman
Argentina	3,587	382	16	4	79	13	11	10
Australia	96,627	21,781	261	86	968	299	45	47
Austria	11,712	299	27	4	166	16	21	7
Azerbaijan	1,454	198	13	3	93	12	16	8
Belgium	88,158	7,504	86	14	654	67	45	30
Brazil	37,861	1,935	88	14	526	50	32	24
Bulgaria	3,615	39	15	2	111	2	12	1
Canada	109,142	22,490	421	154	1,404	419	46	54
Chile	9,454	538	51	5	312	14	24	11
China	29,170	4,397	176	43	1,027	137	55	37
Croatia	2,440	646	17	6	105	21	15	11
Czech Republic	6,192	1,415	31	5	156	17	14	8
Denmark	59,826	13,913	66	9	441	36	45	23
Egypt, Arab Rep.	3,834	742	19	6	143	32	21	20
Finland	32,365	7,261	56	17	432	80	30	26
France	310,868	26,308	518	55	2,701	175	64	40
Germany	316,539	43,973	363	38	2,294	226	65	49
Greece	18,284	958	72	4	319	15	29	12
Hong Kong, China	57,417	6,494	226	30	1,875	205	57	48
Hungary	8,885	430	25	2	183	16	20	14
Iceland	10,551	4,288	41	1	369	11	39	10
India	31,166	2,265	195	22	1,635	53	68	26
Indonesia	5,042	4,280	52	21	270	65	32	26
Iran, Islamic Rep.	2,552	0	10	0	56	0	8	0
Ireland	20,531	4,241	41	20	237	40	26	16
Italy	83,724	19,630	334	63	1,035	197	43	36
Japan	33,429	11,910	431	90	718	179	34	29
Kazakhstan	16,559	653	70	3	829	17	62	16
Korea, Rep.	20,209	4,708	134	27	817	111	51	30
Kuwait	10,574	1,491	30	7	292	17	40	10
Latvia	2,359	0	24	0	233	0	35	0
Luxembourg	64,336	43,995	40	10	498	108	46	38
Malaysia	16,716	1,600	56	15	299	27	27	11
Mexico	41,019	8,097	100	18	701	115	35	32
Netherlands	155,037	13,078	183	27	1,155	153	63	48
New Zealand	23,184	6,363	99	32	326	114	13	21
Nigeria	2,963	478	15	7	60	12	8	6
Norway	50,639	4,927	216	26	837	62	47	18
Oman	2,740	0	15	0	105	0	20	0
Peru	1,425	487	8	4	54	8	7	7
Philippines	3,004	1,343	21	7	157	40	22	19
Poland	9,788	3,147	30	6	227	34	24	19

Appendix Table A2 - cont'd

Country	Volume of cross-border lending (USD m)		Number of cross-border loans		Number of cross-border loan portions		Number of active banks	
	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman	Pre-crisis	Post-Lehman
Portugal	6,270	2,311	22	5	172	27	27	16
Qatar	13,649	3,379	27	7	232	36	31	19
Romania	3,728	754	36	4	226	18	23	12
Russian Federation	123,809	11,138	326	20	2,856	127	76	34
Saudi Arabia	22,997	0	27	0	270	0	32	0
Slovenia	3,815	1,417	19	7	172	43	22	19
South Africa	22,980	2,973	32	10	334	41	30	30
Spain	183,176	18,993	269	60	1,359	238	46	36
Sweden	66,016	4,605	117	11	664	30	41	15
Switzerland	100,474	17,095	101	16	882	158	56	46
Taiwan, China	9,705	1,326	229	48	491	80	25	19
Thailand	6,512	277	47	5	236	20	28	15
Turkey	41,565	6,615	128	18	1,742	227	71	49
Ukraine	7,565	221	74	4	491	10	38	7
United Arab Emirate	26,941	3,053	69	7	531	22	55	16
United Kingdom	385,362	48,073	700	89	3,216	451	77	75
United States	1,322,710	281,858	4,530	1,053	13,878	3,376	82	85
Vietnam	1,108	408	15	5	34	15	6	14

Appendix Table A3
Variable definitions and sources

This table presents definitions and sources of all variables used in the paper. Pre-crisis refers to the period Jan 2005-July 2007 and post-Lehman to the period Oct 2008-Oct 2009. Loan Analytics is Dealogic's Loan Analytics database on syndicated loans. BankScope is Bureau van Dijk's database of bank balance sheet and income statement data. IFS are the International Financial Statistics provided by the International Monetary Fund. Doing Business is the World Bank Doing Business Survey (2008). The variables *Distance, Experience* and *Bank size* are included in logs in the regressions.

Variable name	Measurement period	Unit	Description	Source
			Data on bank-destination country pairs (# banks = 118 and # of destination countries is 60)	
Volume	Jan 05-Oct 09	%	Change in the amount of cross-border lending by bank i to country j post-Lehman compared to pre-crisis	Loan Analytics
Sudden stop	Jan 05-Oct 09	0/1	Dummy that is 1 if lending from bank i to country j declined by 75 per cent or more in the post-Lehman period	Loan Analytics
Numbers	Jan 05-Oct 09	%	Change in the number of cross-border loans by bank i to country j post-Lehman compared to pre-crisis	Loan Analytics
Distance	2005	km	Distance in km between bank i and country j according to the great circle distance formula	CIA World Factbook 2005
Subsidiary	End 07	0/1	Dummy variable that is 1 if bank i majority owns a bank subsidiary in country j	BankScope
Domestic lenders	00-Sep 09	%	Number of different domestic lenders (banks, insurance companies, etc.) in country j with whom bank i has cooperated in a syndicate between 2000 and the time of the Lehman Brothers collapse / all domestic lenders	Loan Analytics
Experience	00-Sep 09	No. loans	Number of loans provided by bank i to country j since 2000 that had matured by August 2007	Loan Analytics
Exposure	Sep-09	%	Outstanding loan volume by bank i to country j as a percentage of total assets of bank i at the time of the Lehman Brothers collapse	Loan Analytics
Border	2005	0/1	Dummy variable that is 1 if the home country of bank i and country j share a common border	CIA World Factbook 2005
Common language	2005	0/1	Dummy variable that is 1 if the home country of bank i and country j share the same dominant language	CIA World Factbook 2005
Colonial links	2005	0/1	Dummy variable that is 1 if the home country of bank i and country j shared the same colonizer or one country used to be the colony of the other country	CIA World Factbook 2005
Credit info	2008	points	Difference between the score of the home country of bank i and country j on a credit information index that captures rules affecting scope, access and quality of credit information	Doing Business
Legal difference	2005	points	Dummy variable that is 1 if the origin of the legal system of the home country of bank i and country j differ	CIA World Factbook 2005
			Bank data (# banks = 118)	
State support	Aug 07-Oct 09	0/1	Dummy that is one if bank i received government support during the financial crisis	Internet, various publications
Bank size	End 06	USD billion	Total assets of bank i	BankScope
Bank solvency	End 06	%	Equity to total assets of bank i	BankScope
Change bank solvency	End 09-End 06	% point	Change in bank solvency	BankScope
Bank liquidity	End 06	%	Liquid assets to deposits and other short-term funding of bank i	BankScope
Change bank liquidity	End 09-End 06	% point	Change in bank liquidity	BankScope