Transmission of Bank Liquidity Shocks in Loan and Deposit Markets: The Role of Interbank Borrowing and Market Monitoring

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March, 2011

Abstract

We examine the international transmission of bank liquidity shocks from multinational bank-holding companies to their subsidiaries. Our findings are consistent with the studies that document that parent bank fragility negatively affects lending by subsidiaries. We further find that reduction in foreign bank lending is stronger for those that are dependent on the interbank market. Moreover, foreign bank lending is determined by different factors in emerging markets and in developed countries. Finally, we show that especially during the recent crisis, liquidity needs determine the change in deposits in developing economies whereas in developed countries, market discipline plays a relatively more important role.

Keywords: foreign banks, credit supply, market discipline
JEL Codes: F15, F34, G21

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1. Introduction

International transmission of financial shocks is the subject of several studies in the banking literature. One of the channels identified is the transmission of liquidity shocks from parent banks' balance sheets to their subsidiaries' lending activity. Previous studies find that foreign bank subsidiaries rely heavily on the use of internal capital that may result in propagation of domestic liquidity shocks and reduced lending (Peek and Rosengren, 1997, 2000). Recent research that investigates the influence of the global liquidity crunch on foreign banks confirms the existing results and documents that foreign banks indeed reduced their lending during the subprime crisis (Popov and Udell, 2010).

Little is known, however, how this mechanism works, what is the role of the interbank market and which banks and countries are particularly affected. We try to answer these questions by examining the foreign bank subsidiary channel. We do this by investigating the behaviour of foreign subsidiaries, including the recent global crisis. We believe that this event offers unique characteristics to examine this issue due to its scale and contagion effects. Moreover, we extend the existing work by investigating an additional potential channel of shock transmission – the deposit market. Especially, we look at the existence of market discipline in host countries in relation to parent banks' financial conditions. Therefore, we strongly believe that we contribute to the recent literature on international transmission of financial distress by focusing on credit and deposit activities of foreign bank subsidiaries as two potential channels of financial shock transmission during a global crisis. The results provide valuable suggestions for the future regulation of multinational banking.

In the last two decades, financial integration resulted in an increase of foreign ownership in the banking sectors across large number of countries. A long line of research supports this development by documenting the stabilizing role of foreign banks in developing countries (Demirgüç-Kunt and Enrica, 1997). Foreign bank entry is associated with credit growth and

reduced likelihood of crises.[1] Moreover, empirical studies show that foreign bank lending remained unaffected during crises in host countries, partly due to the support received from parent banks (Martinez Peria et al., 2002 and de Haas and van Lelyveld, 2006, 2010).

While adverse affects of host country crises are mitigated by foreign banks, home country economic cycles may influence the host country as documented by Peek and Rosengren (1997, 2000). However, there is limited and mixed evidence on whether or not international banking may have adverse effects on financial stability. Jeanneau and Micu (2002) find a positive relationship between bank lending to emerging countries and the economic cycles in the developed countries. Goldberg (2001) documents mixed results for Asia and Latin America, while Martinez Peria et al. (2002) find that home country problems increase foreign lending in developing countries. Similarly, de Haas and van Lelyveld (2010) find that increased GDP in the home country negatively affects the credit growth of subsidiaries, whereas the strength of a parent bank has a positive influence. Finally, Popov and Udell (2010) investigate the effect of financial distress of parent banks on loan rejection rates in regions where the subsidiary is located, and document the existence of loan supply shocks to Central and Eastern European (CEE) countries during the crisis years from 2007 to 2008. They find that foreign banks reduced lending to a greater extent compared to domestic banks in this period. However, they do not identify a direct influence of the parent bank on its subsidiaries.

As a result we do not know whether all or only selected foreign banks reduced lending during the crisis. At the same time, we may assume that some of the foreign banks operate without receiving financial support from parent banks, while others depend heavily on their parents and interbank markets in order to finance their loan growth. Hence, we should expect a large variation across foreign banks depending on the way they are financed. We try to shed

[1] See Clarke et al. (2003) for a review.

some light on this by analyzing the determinants of foreign subsidiaries' lending behaviour across different countries by examining the periods before the crisis as well. We assume that one of the possible channels for the observed reversal in lending is the funding of foreign banks. Therefore we extend further the analysis by focusing on market discipline and investigating whether subsidiary and parent bank characteristics can explain the behaviour of deposits and deposit rates. Namely, we expect that depositors in the host country may have penalized subsidiaries of riskier parent banks by withdrawing their savings, which may explain the shortage of funding and a reduction in their lending during the crisis. Further, we believe that foreign subsidiaries with riskier parent banks and that are strongly dependent on interbank markets competed more aggressively for new deposits as a source of financing during the crisis.

Indeed, using a sample of 51 multinational banks and their subsidiaries in 99 countries, we find evidence that parent bank fragility (such as higher loan loss provisions) reduces lending by subsidiaries. The results show that during the crisis, one of the main determinants of lending has been the ability to borrow in the interbank market. We document that reduction in foreign bank lending in host countries is more significant for those foreign banks that were strongly dependent on the interbank market. Moreover, we also find that the decline in foreign bank lending is partially determined by different factors in emerging markets and in developed countries. We attribute it to the different size and structure of foreign banks in emerging markets, which consist of large banks acquired as a process or privatization and small de novo banks. In contrast, multinational banks target mainly small and poor performing banks in developed countries, a potential reason for the inefficiency of foreign banks in those markets (Peek et al, 1999). In our opinion, the differences in size and the structure in developed and developing countries drive the mixed results for market discipline, suggesting that it plays a more important role in developed countries. Again, one of the

determinants of banks' liquidity needs seems to be the access to the interbank market by foreign banks.

Our paper is related to a number of studies on the impact of the recent crisis on foreign banks in the host countries (Popov and Udell, 2010; Navaretti et al., 2010). It builds upon empirical work on internal capital markets that makes use of subsidiary and parent bank-level variation to identify the determinants of foreign bank lending (de Haas and van Lelyveld, 2010). However, we extend the model in two directions. First, we add the interbank market, which we believe to be important in explaining the loan activity of foreign banks, especially during the crisis. Second, we analyze the changes in deposits policy of foreign banks. Deposits policy of foreign banks might be important as recently Allen et al. (2011) document that foreign bank deposits as well as intragroup deposits were an important part of internal capital market transactions in bank holding companies during the recent crisis.

Overall, our main results confirm the existence of a subsidiary channel yet again we emphasize also the importance of the interbank market in this transmission mechanism. We also document that the sensitivity of lending by foreign banks to parent bank characteristics differ in developed and emerging markets. Finally, we provide new evidence on the effects of market discipline on foreign subsidiaries during a global financial crisis. To the best of our knowledge, this study is the first to investigate the market discipline in an international transmission context.

These findings have numerous policy implications concerning the recent increasing trend in foreign ownership in the banking sector. The current crisis and the recent evidence on reduced lending by foreign banks in CEE markets may question the idea of liberalizing and opening the banking sectors to foreign capital. The problem does not only concern emerging markets but also developed countries such as United Kingdom or the Scandinavian countries and their experience with Icelandic foreign banks.

While we do not explore the variation in ownership, we document that foreign banks that rely on interbank markets reduce their lending significantly during a crisis that originates in the home country. Hence, access to capital seems to be important in understanding foreign bank activity. This also suggests that multinational banks should be regulated as one unit by an international supervisory authority, or more power should be extended to that authority, as suggested by Pistor (2010).

The remainder of the paper is organized as follows. In section 2, we describe the data, our empirical strategy and our hypotheses. We investigate the impact of parents' financial performance on the loan supply and deposit collection of their subsidiaries and present the estimation results in section 4. Section 5 concludes.

2. Data and Methodology

The sample used in this study consists of multinational banks and their foreign subsidiaries. We select the multinational banks using a 2008 ranking published by the Banker magazine, where we concentrate only on the first 150 banks. We exclude those banks that do not have any foreign subsidiaries, or when we are not able to retrieve data for them. Using this methodology we select the 51 largest banks from twenty developed countries and all of their subsidiaries in the world[2]. We exclude, however, those subsidiaries that were located in the same country as the parent bank since we are mainly interested in identifying the international transmission of financial shocks. Table A1 and A2 in the Appendix present the list of parent banks, number of subsidiaries for each bank and the list of countries with foreign subsidiaries in the sample.

We obtain financial data for multinational banks and their subsidiaries from the BankScope database. We use unconsolidated financial data for the multinational banks and

[2] The subsidiaries are located in 113 countries including both developed and developing economies. We also exclude offshore financial centres. The final sample of subsidiaries consists of 99 countries.

consolidated statements for their foreign subsidiaries. We convert all bank variables into US dollars. Our data cover the period from 1990 to 2008, but the panel is unbalanced due to missing information on some institutions and years.

We examine the international transmission of bank liquidity shocks from multinational bank holding companies to their subsidiaries. To test our hypothesis we follow the approach established in de Haas and van Lelyveld (2010). However, our analysis distinguishes itself from their model as we extend the investigation by including the role of interbank market dependency as well as studying the parent effects on market discipline in different countries. Moreover, we have a larger sample in terms of the time period, number of multinational banks and countries covered. Finally, our time frame takes the period of the global crisis into account, which we find to be important in assessing the relationship between parent banks and subsidiaries.

2.1. Variable Definitions

In the first part of the paper we aim to examine the link between a parent bank and the credit supply of its foreign affiliate. De Haas and van Leyveld (2010) show that lending growth of a foreign subsidiary is not only determined by its own but also by its parent's health and by host and home country variables. We follow their approach and use the annual change in loans ($\Delta Loans$), representing the first difference of the log of total loans for a subsidiary, as the dependent variable. When explaining the change in loans, we also explore the differences between developed and emerging countries.

We include subsidiary and parent bank characteristics as well as host and home country variables. Bank variables for both groups include loan loss provisions to net interest revenues (*Loan Loss)*, return on equity (*ROE*), equity to total assets (*Equity*) and liquid assets to total assets (*Liquidity*). [3] We include *Size* defined as log of total assets only as a subsidiary

[3] Alternatively, we also include ROA to measure profitability and the results remain virtually unchanged.

characteristic. Finally, we include *Interbank* ratio defined as interbank lending to borrowing.[4] We expect that subsidiaries less dependent on the interbank market and hence more on deposits may be less affected by the problems of the parent banks as they substitute for internal markets.

The second group consists of location specific factors and includes country level controls. We include the *GDP Growth* (host and home country) and *Exchange Rate* in US Dollars. We expect that foreign banks will expand lending if local GDP and the currency are strong. In addition, we include the *Concentration Ratio,* defined as the share of assets of three largest banks to the assets of all commercial banks in a host country. We expect that highly concentrated banking sectors will be less affected by the liquidity shock transmission due to the power of existing banks. We also include *Cost to Income* to control for the efficiency of the banking sector, measured as total costs as a share of total income of all commercial banks in the host country. We expect that more efficient banks are able to better react to market conditions and thus will not be as strongly affected by the liquidity shock transmission as the other banks. Table 1 provides a list of variable definitions and Table 2 presents the summary statistics.

One word of caution is needed when the loan supply shock is examined, as it is crucial to identify supply and demand effects. Country specific variables enable us to isolate loan demand effects to some extent. Moreover, we can potentially identify the external liquidity shock by including the interbank transactions of home and host countries. However, transmission of shocks may occur through two interdependent channels: parent bank's lending to foreign subsidiaries and through cross-border lending, which would affect the entire economy including domestic banks as well (Cetorelli and Goldberg, 2009). Although

[4] In the estimations, we do not include *Liquidity* and *Interbank* ratio simultaneously as *Liquidity* is potentially determined by interbank lending and borrowing. We choose not to report the results with *Interbank* ratio that are inline with the reported results.

we cannot trace the transactions between the foreign subsidiaries and the parent banks, we can identify such an external shock to subsidiaries by investigating the ratio of aggregate interbank lending/borrowing of a foreign bank and its parent bank to distinguish 'the credit channels to subsidiaries' from 'cross-border lending'.

2.2. Market discipline

In the second part of the paper, we focus on market discipline and test whether bank and parent bank characteristics can explain the behavior of deposits and deposit rates. We also investigate whether these effects differ between the developing and developed countries.

Most empirical findings document the existence of market discipline.[5] Martinez Peria and Schmukler (2001) investigate the role of deposit insurance in market discipline during the crisis. They find that deposit insurance does not diminish the degree of market discipline. In a later study, Martinez Peria et al. (2004) examine the relationship between the systemic risk and market discipline and identify their mechanisms. The authors find that systemic shocks increase the degree of market discipline regardless of banks' fundamentals. Following these studies, we introduce the following variables to test for market discipline. First, we use deposit growth defined as the first difference of the log of time deposits, Δ*Time Deposits.* We expect a positive relationship between banks' fundamentals and time deposits as existing studies reported that depositors punish banking institutions for excessive risk taking by withdrawing their savings. We also include the change in bank deposits (Δ*Bank Deposits*) as the second market discipline measure. The effect is expected to be higher for bank deposits compared to time deposits, as bank deposits are not covered under deposit insurance schemes. Since depositors can also discipline banks by requiring higher interest rates, we introduce a third dependent variable, *Interest Rates*. We use an implicit measure, as in Martinez Peria and Schmukler (2001), by dividing the total interest rate expenses by total interest bearing

[5] See Flannery (1998), De Ceuster and Masschelein (2003), Kaufman (2003), and Flannery and Nikolova, (2004).

deposits. Consequently, we also control for subsidiary and parent bank characteristics, included into regressions as lagged variables.[6]

3. Results

3.1. Lending Channel

We explore the impact of home country shocks on foreign subsidiaries' lending by estimating:

$$\Delta Loan_{it} = f(Bank_{it}, Country_{it}, ParentBank_{it}, ParentCountry_{it}) \quad (1)$$

where $\Delta Loan_{it}$ is the change in total loans of subsidiary i in year t; $Bank_{it}$ is a matrix of foreign subsidiary controls of subsidiary i and $Country_{it}$ is a matrix of macroeconomic variables of the country where the subsidiary i is located. $ParentBank_{it}$ is a matrix of parent bank characteristics of subsidiary i in year t; $ParentCountry_{it}$ is a matrix of macroeconomic variables of the parent bank country of subsidiary i.

Table 3 reports the fixed effects panel estimation results explaining the change in loans of a subsidiary. In the first three specifications, we present the results for the entire panel.[7] The first specification includes subsidiary and host country characteristics. In the second specification, we add the parent bank and home country variables. The number of observations drops significantly due to lack of certain variables and the unbalanced structure of the data. In the third specification, we introduce a new variable, *Crisis*, equal to one for the years 2007 and 2008 that should capture the impact of the global financial crisis. We also

[6] Subsidiary and parent bank characteristics are included with a lag since financial statements are disclosed with a delay. This needs to be considered as we aim to analyze the depositors' reaction here.

[7] In all estimations, we exclude the host countries that are considered as offshore financial centers. We exclude the following countries: Bahamas, Bermuda, Cayman Islands, Cyprus, Gibraltar, Liechtenstein, Luxembourg, Malta, Monaco, Netherlands Antilles, Seychelles, Switzerland, Vanuatu and Western Samoa. However, re-estimating our model including those countries does not change our results.

interact this variable with each parent bank characteristics to investigate whether we find a different or stronger impact of the lending channel during the crisis in the home countries. We further exclude the Asian parents in these estimations as the crisis originated in the U.S. and the European banks were directly affected by the financial crisis relatively earlier and to a larger extend than the rest of the world.

The results show that foreign subsidiaries with higher capitalization reduce lending, while other internal factors are insignificant. On the other hand, higher economic growth in the host country and a stronger currency has a positive influence on a foreign bank's lending. We find evidence for the lending channel, as an increase in loan loss provisions of the parent negatively affects the loan growth of a subsidiary. Moreover, we also show that lower GDP in the home country increases the lending activity of foreign subsidiaries. This suggests a substitution effect, which is in line with the findings of de Haas and van Lelyveld (2010). We do not find, however, evidence for the impact of parent characteristics on subsidiary lending during the crisis of 2007-2008.

The data present large variation between foreign subsidiaries operating in developed and developing countries (see Table 2). We therefore split the sample and estimate the same model separately for those two groups of countries. We distinguish them using the World Bank classification form 2008. The results, shown in Table 3, confirm that lending by foreign subsidiaries in developing and developed countries are not determined by the same set of factors. Specifically, "lending-channel" is more relevant for developing economies. On the other hand, in more advanced economies bank internal factors determine the lending activity. Loan loss provisions of the parent bank seem to affect both groups, however the results are stronger for the developing countries. Nevertheless, other bank characteristics do not have an influence for the sample of these countries. Conversely, we find a negative and statistically significant coefficient of size and equity ratio among the subsidiary characteristics located in

developed countries. The results could signal that it is easier for multinational banks to operate on a smaller scale in developed countries, where the competition is very high and sophisticated. The fierce competition in those countries reflects the lower profitability of subsidiaries in developed countries in comparison to those operating in developing countries. Moreover, Classens and van Horen (2009) document that foreign banks tend to perform better compared to domestic banks when coming from a high(er)-income country.

Among the macroeconomic variables, economic growth and exchange rate matter only for developing countries. Furthermore, we also observe a significant impact of market structure on the lending growth in the developing countries. On the other hand, we observe that a substitution effect dominates in developed countries. In other words, home country problems increase foreign lending in developed countries. Moreover, subsidiaries of highly capitalized and liquid banks decrease their lending during the recent crisis if they are located in a developed country.

Lastly, to explore the mechanisms of the financial shock transmission, we split the developing country sample based on *Interbank* ratio of the subsidiary. The first (second) group includes banks with an interbank ratio below (above) one and is considered as more (less) dependent on interbank borrowing. In contrast, an interbank ratio above one means that the foreign subsidiary is a net placer on the interbank market and hence it should not have been constrained in lending by the liquidity crunch during the recent crisis. Moreover, we hypothesize that the shock is transmitted through the interbank channel to subsidiaries. However, as direct transactions between the foreign subsidiaries and the parent banks are not available, we aim to capture this by including the interbank ratio of the parent bank in the last specification. The results of the estimations are presented in Table 4.

As expected, we find that subsidiaries with higher reliance on interbank market are more sensitive to the parent's financial performance. The results suggest that subsidiaries that rely

more heavily on interbank borrowing decrease their lending when the parent banks have higher loan loss provisions. The magnitude of the effect becomes even stronger during the crisis and when we control for the interbank ratio of the parent. We also find that subsidiaries reduce their lending during the crisis when the parent bank is profitable. An explanation for the results is the substitution effect observed by de Haas and van Leyveld (2010), where the funds are diverted from foreign subsidiaries to the parent bank, when it is more profitable. Another and not mutually exclusive explanation is that the reduced lending is the result of the liquidity crunch observed during the crisis, which increased the cost and reduced significantly the availability of funding for foreign subsidiaries through the interbank markets. As a result of the substitution effect, those foreign banks that relied heavily on interbank markets and that had profitable parent banks could not substitute the shortcoming and needed to scale down during the crisis. Indeed, we find that foreign subsidiaries with a higher interbank ratio increase their lending when the parent has higher loan loss provisions during the crisis. This behavior confirms the substitution effect that we did not find for developing countries in previous estimations.

3.2. Market Discipline

We estimate the following model to examine the existence of the market discipline in relation to the transmission of financial shocks:

$$MarketDiscipline_{it} = f(Bank_{it-1}, Country_{it}, ParentBank_{it-1}, ParentCountry_{it})$$

We include a similar set of variables to explain the market discipline variables. We measure market discipline by Δ*Time Deposits,* Δ*Bank Deposits* and *Interest Rates* respectively. Table 5 presents the results for the entire sample. We report the results using both fixed and random effects estimators. We use random effects estimator in order to include the deposit insurance dummy that is not time varying. However, we report the random effects estimators only when the Hausman test is not rejected.

In general, most specifications indicate the existence of market discipline and certain subsidiary and parent fundamentals influence the change in time deposits. We find that the depositors react to a deterioration of bank performance and punish their institutions by withdrawing their savings. In the first group of results, we find some evidence for an inverse effect of loan loss provisions on time deposit growth. We also find that subsidiaries with more profitable parents can increase their time deposits during the recent crisis, a result not supported by the random effects estimator.

In the second panel, we do not report the random effects results, first because controlling for deposit insurance is not needed when explaining bank deposits, and second because the results are in line with the fixed effects models. We find that profitable and capitalized subsidiaries experience a decrease in interbank borrowing, pointing to a lower need and preference for liquidity. Alternatively, this might indicate the support provided from a parent institution to a financially weak foreign affiliate through the interbank deposits. This finding is also consistent with the previous evidence, where we report that parent banks tend to support their subsidiaries during local economic contraction. Moreover, an increase in loan loss provisions of the parent leads to a decrease in bank deposits during the recent crisis, which can be attributed to two possible reasons. First, a worsening in the performance of the parent may have induced the participants in the interbank market to decrease their lending to the subsidiary. Second, if the parent is a significant lender to the subsidiary, having problems in the loan portfolio may lead them to reduce lending to their subsidiaries. Similarly, if the parent bank decides to stay more liquid during the crisis in the home country, their subsidiaries experience reduction in bank deposit accounts.

The results on interest rates continue to support the existence of market monitoring. Stronger and larger subsidiaries are not required to pay higher deposit rates. The estimations show that higher loan loss provisions increase the deposit rates of a foreign affiliate. Higher

loan loss provisions by the parent are also related to higher interest rates paid, pointing to the difficulties subsidiaries face in collecting deposits. In other words, the deterioration of parent banks' financials force foreign banks to compete for deposits in order to substitute the parent bank funding resulting in higher interest rates paid.

Table 6 and Table 7 present the same model specifications for developing and developed countries, respectively. Our findings suggest that in developing countries the market discipline is determined by both factors: subsidiary fundamentals and its parent bank. On the other hand, subsidiaries in developed countries do not seem to be affected much by parent bank fundamentals. We find that loan loss provisions of the parent bank negatively (positively) influence the time deposits (interest rates) in developing countries. In developed countries, most subsidiary variables play a role. We also observe a difference between the countries during the crisis. Although the results differ to a certain extent within the groups, they suggest that market discipline is of less importance during the crisis. We find that subsidiaries with profitable parents experience an increase in their time deposits. However, loan loss provisions by the parent (when interacted with the crisis dummy), lead to an increase in time deposits of the subsidiary. We further document that bank deposits in developing countries are inversely affected by increases in parents' liquidity ratios as in the previous estimations. Our findings suggest that foreign banks in developing countries experienced a liquidity shock due to their parent's financial condition where they were forced to fight for other funds. A special report by Fitch Ratings (2009) explains such a change in funding strategy at parent banks where they delegate more responsibility to their subsidiaries in terms of deposit collection in emerging countries. As a consequence, the parent banks were ring-fencing their foreign subsidiaries by reducing the funding available to them. In many countries, the reduced funding to foreign subsidiaries may have destabilized the whole system and hence the necessary liquidity was provided by programs introduced ad hoc by national

central banks or multinational organizations such as EBRD or IMF in Central Europe (Pistor, 2010). Indeed, the situation confirmed the possibility of a "nightmare situation" described by Herring (2007), whereas the foreign subsidiaries with large shares in the host markets become systematically important, while at the same time they are not that important for the parent bank because of their small size relative to the multinational banking group.

In line with the previous section, we split the sample of subsidiaries in developing countries based on the *Interbank* ratio, again. As before, the first (second) group includes banks with an interbank ratio below (above) one. Table 8 presents the results for both groups explaining the change in time deposits and interest rates. We find that highly capitalized subsidiaries in the first group have lower time deposits. We also document that during the crisis, funding concerns play a more important role for the sample of banks relying on interbank borrowing. While higher loan loss provisions of the parent lead to a decrease in time deposits, the total effect turns to be positive in the crisis, suggesting again a change in the funding strategy as found in the previous estimations. However, for the sub-sample of foreign banks with an interbank ratio higher than one, the results point to the existence of market discipline. Stronger banks with higher equity and with capitalized parents experience an increase in time deposit levels during the crisis. In addition, higher loan loss provisions of the parent lead to higher deposit rates. On the other hand, subsidiaries of profitable parents are also able to afford to pay higher rates.

4. Conclusion

In this paper, we investigate the international transmission of bank liquidity shocks from multinational bank holding companies to their foreign subsidiaries. Recent studies document that foreign banks reduced their lending during the subprime crisis. However, little is known about the transmission mechanisms. We explore the subsidiary channel by focusing on the role of the interbank market and the differences between countries by examining the period

before the global crisis as well. Moreover, we investigate the existence of market discipline in host countries in this context and contribute to the literature on international transmission of financial shocks in deposit markets.

Our findings are in line with the studies on multinational banks' internal capital markets (de Haas and van Lelyveld, 2010). Using a sample of 51 multinational banks and their foreign subsidiaries, we find evidence that parent bank fragility negatively affects lending by subsidiaries. As expected, this effect is stronger for those foreign banks that rely on interbank borrowing. We also find that lending by subsidiaries in developing and developed countries are not determined by the same set of factors. In particular, "lending-channel" seem to be more relevant for the developing economies, whereas in more advanced economies, bank fundamentals determine the lending activity.

Finally, we examine the existence of the market discipline in relation to the transmission of financial shocks. We find that the depositors react to a deterioration of bank performance and punish their institutions by withdrawing money or by asking for higher interest rates. Higher interest rates may also be a part of the foreign bank policy, as they may compete for deposits in the host market to substitute for the reduced availability of funds from the parent bank, or the interbank markets.

Moreover, we show that market discipline plays a more important role in developed countries whereas liquidity needs determine the change in deposits in developing economies, especially for banks that rely on interbank borrowing. The dependence on the interbank market may also explain why market discipline is weaker during the crisis suggesting that interbank dependent banks, regardless of their financial performance, are forced to compete for deposits what drives the deposit rates higher.

Our findings have several policy implications concerning the recent increasing trend in foreign ownership in the banking sectors in emerging economies and the interbank market

transactions. We document that foreign banks that relied on interbank markets reduced their lending significantly during a crisis in the home country. Moreover, the results suggest that the reduction may have been caused by the financial situation of the parent bank as well as changes in its funding strategy towards the subsidiaries.. In our opinion, these findings point to the need of regulating and monitoring multinational banks by an international supervisory authority.

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Table 1 Variable Definitions

Data Source	Variable	Definition & Measurement
BankScope	**Dependent Variables**	
	ΔLoans	$\text{Log (Total Loans)}_t - \text{Log (Total Loans)}_{t-1}$
	ΔTime Deposits	$\text{Log (Time Deposits)}_t - \text{Log (Time Deposits)}_{t-1}$
	ΔBank Deposits	$\text{Log (Bank Deposits)}_t - \text{Log (Bank Deposits)}_{t-1}$
	Interest Rates	Interest Rate Expenses to Interest-Bearing Deposit
BankScope	**Bank Characteristics**	
	Total Assets	in million USD
	Loan Loss	Loan Loss Provisions to Net Interest Revenues
	Equity	Equity to Total Assets
	ROE	Return on Equity
	Liquidity	Liquid Assets to Total Assets
	Interbank	Interbank Lending to Interbank Borrowing
	Country Variables	
WDI	GDP growth	Yearly change
BankScope	Exchange rate	Exchange Rate from Local currency to USD
Fitch BankScope	Concentration	Assets of three largest banks as a share of assets of all commercial banks $CR3_{jt} = \sum_{i=1}^{3} s_{ijt}$
Fitch BankScope	Cost to Income	Total Costs as a share of Total Income of all commercial banks
	Developed	developed=1 developing=0
Demirguc-Kunt, Karacaovali and Laeven (2005)	Deposit insurance	explicit=1 implicit=0

Table 2 Summary Statistics

Variable		Obs	Mean	Std. Dev.
Dependent Variables	**Subsidiary**			
ΔLoans		3,254	0.088	1.061
	Developing	1,793	0.117	1.106
	Developed	1,461	0.053	1.002
ΔTime Deposits		2,441	0.050	1.155
	Developing	1,352	0.070	1.204
	Developed	1,089	0.026	1.091
ΔBank Deposits		2,767	0.069	1.513
	Developing	1,466	0.097	1.696
	Developed	1,301	0.036	1.277
Interest Rates		3,763	0.100	0.217
	Developing	2,082	0.123	0.267
	Developed	1,681	0.072	0.127
Bank Characteristics				
Total Assets (mln USD)	**Subsidiary**	4,079	9,302	38,587
	Developing	2,280	2,269	5,627
	Developed	1,799	18,215	56,522
Loan Loss	**Subsidiary**	3,591	0.175	0.651
	Developing	2,048	0.206	0.692
	Developed	1,543	0.135	0.589
	Parent	*475*	*0.211*	*0.353*
Equity	**Subsidiary**	4,072	0.124	0.127
	Developing	2,277	0.140	0.127
	Developed	1,795	0.105	0.124
	Parent	*615*	*0.165*	*0.266*
ROE	**Subsidiary**	4,057	0.131	0.375
	Developing	2,264	0.162	0.471
	Developed	1,793	0.091	0.188
	Parent	*590*	*0.103*	*0.191*
Liquidity	**Subsidiary**	2,947	0.194	0.320
	Developing	1,536	0.193	0.222
	Developed	1,411	0.196	0.401
	Parent	*451*	*0.132*	*0.150*
Interbank	**Subsidiary**	3,023	1.708	2.104
	Developing	1,612	1.906	2.251
	Developed	1,411	1.481	1.899
	Parent	*483*	*1.031*	*1.068*
Country Variables				
GDP growth	**Subsidiary**	1,410	0.043	0.045
	Developing	899	0.049	0.052
	Developed	511	0.033	0.024
	Parent	*273*	*0.026*	*0.021*
Exchange rate	**Subsidiary**	1,453	0.610	0.958
	Developing	928	0.413	1.109
	Developed	525	0.959	0.424
Concentration	**Subsidiary**	1,338	0.618	0.196
	Developing	829	0.607	0.183
	Developed	509	0.637	0.215
Cost to Income	**Subsidiary**	1,332	0.678	0.207
	Developing	827	0.701	0.222
	Developed	505	0.642	0.175
Deposit insurance	**Subsidiary**	109	0.679	0.469
	Developing	76	0.645	0.482
	Developed	33	0.758	0.435

Table 3 Loan Growth

				developing			developed		
	1	2	3	1	2	3	1	2	3
subsidiary characteristics									
Loan Loss	0.021	0.094	0.091	0.049	0.159	0.146	-0.083	-0.043	-0.039
	[0.061]	[0.097]	[0.118]	[0.055]	[0.114]	[0.141]	[0.072]	[0.085]	[0.081]
ROE	0.027	0.076	0.055	0.077	0.093	0.067	-0.028	-0.122	-0.278
	[0.099]	[0.077]	[0.083]	[0.079]	[0.073]	[0.075]	[0.208]	[0.535]	[0.624]
Equity	**-1.797****	**-2.431****	**-2.631****	-0.358	-0.794	-1.023	**-3.597*****	**-4.014*****	**-3.994*****
	[0.784]	[0.941]	[1.017]	[0.856]	[1.122]	[1.178]	[1.017]	[1.336]	[1.456]
Liquidity	0.163	-0.073	-0.045	0.297	0.008	0.092	0.118	0.009	-0.012
	[0.265]	[0.167]	[0.181]	[0.388]	[0.304]	[0.321]	[0.148]	[0.158]	[0.155]
Size	-0.002	-0.080	-0.123	**0.080***	0.013	-0.083	**-0.157***	**-0.269***	-0.241
	[0.041]	[0.077]	[0.091]	[0.047]	[0.088]	[0.113]	[0.094]	[0.158]	[0.173]
host country									
GDP growth	**2.329****	**2.507****	**3.123****	**1.821***	1.711	2.128	1.062	4.743	7.991
	[1.066]	[1.234]	[1.437]	[1.065]	[1.169]	[1.346]	[4.627]	[6.826]	[6.725]
Exchange rate	**0.088*****	0.047	0.152	**0.107*****	0.48	**0.690***	0.024	-0.013	0.336
	[0.021]	[0.301]	[0.342]	[0.028]	[0.346]	[0.369]	[0.232]	[0.413]	[0.421]
Concentration	0.122	0.676	0.828	0.227	**1.062***	**1.347***	0.050	-0.296	-0.247
	[0.300]	[0.486]	[0.540]	[0.386]	[0.623]	[0.690]	[0.417]	[0.687]	[0.853]
Cost to Income	0.107	0.151	0.159	0.1	0.239	0.226	-0.035	-0.120	-0.878
	[0.214]	[0.308]	[0.379]	[0.262]	[0.425]	[0.427]	[0.365]	[0.469]	[0.828]
parent characteristics									
Loan Loss		**-0.398****	**-0.634****		**-0.525****	**-0.630***		-0.156	**-0.564***
		[0.179]	[0.289]		[0.258]	[0.372]		[0.187]	[0.311]
ROE		-0.310	0.107		-0.597	-0.172		0.042	0.234
		[0.234]	[0.634]		[0.452]	[0.836]		[0.229]	[0.925]
Equity		0.436	0.532		0.383	0.506		0.799	-0.133
		[1.448]	[1.514]		[2.153]	[2.175]		[1.216]	[1.487]
Liquidity		0.555	0.426		0.519	-0.019		1.138	1.634
		[0.468]	[0.603]		[0.623]	[0.814]		[0.964]	[1.038]
home country									
GDP growth		-3.268	**-9.049****		-4.549	-7.134		-4.591	**-17.422****
		[2.485]	[4.188]		[3.478]	[5.033]		[4.076]	[7.713]
Crisis			**0.604***			0.335			**1.242***
			[0.361]			[0.358]			[0.640]
interactions									
*crisis*P_Loan Loss*			-0.428			-0.285			-1.031
			[0.590]			[0.668]			[0.857]
*crisis*P_ROE*			-0.614			0.236			-1.974
			[1.022]			[1.231]			[1.359]
*crisis*P_Equity*			-5.662			-4.434			**-9.955***
			[4.661]			[6.452]			[5.787]
*crisis*P_Liquidity*			-0.482			1.070			**-2.843****
			[1.465]			[1.937]			[1.357]
Constant	0.005	0.418	0.679	-0.783	-0.776	-0.314	1.673*	2.752*	2.92
	[0.420]	[0.800]	[0.877]	[0.477]	[0.901]	[0.964]	[0.957]	[1.630]	[1.884]
Observations	1674	978	881	1059	605	566	622	374	316
Number of banks	286	185	169	0.012	0.021	0.031	105	75	65
R-squared	0.015	0.025	0.034	184	111	105	0.044	0.062	0.083

The table reports the fixed effects panel estimation results. The dependent variable is ΔLoans, yearly change in loans measured as the first difference of the log of total loans. Third specifications exclude the Asian parents. All variable definitions are presented in Table 1. Robust standard errors are in parentheses. ***,**, * significant at 1%, 5% and 10%, respectively.

Table 4 Loan Growth and Interbank Dependency

	Interbank<1				Interbank>1			
	1	2	3	4	1	2	3	4
subsidiary characteristics								
Loan Loss	-0.014	-0.123	-0.177	-0.151	0.024	0.141	0.100	0.068
	[0.063]	[0.121]	[0.160]	[0.153]	[0.050]	[0.123]	[0.170]	[0.089]
ROE	0.016	0.045	0.069	-0.011	0.158	0.004	-0.115	0.106
	[0.066]	[0.063]	[0.075]	[0.063]	[0.138]	[0.150]	[0.178]	[0.238]
Equity	0.940	1.237	0.548	0.911	**-2.330****	-1.919	-2.035	-0.561
	[1.111]	[2.633]	[2.647]	[1.801]	[1.169]	[1.445]	[1.566]	[1.256]
Liquidity	0.113	0.019	0.013		0.679	0.213	0.232	
	[0.343]	[0.420]	[0.501]		[0.588]	[0.669]	[0.712]	
Size	0.142	0.017	-0.110	0.048	0.025	0.054	-0.077	-0.082
	[0.096]	[0.145]	[0.212]	[0.192]	[0.082]	[0.161]	[0.203]	[0.108]
host country								
GDP growth	**4.182****	4.462	4.938	**5.654***	-0.322	-0.682	-1.024	0.885
	[1.860]	[2.893]	[3.101]	[2.946]	[1.636]	[1.576]	[1.850]	[1.672]
Exchange rate	0.182	0.176	-0.165	-0.215	**0.081*****	0.433	0.757	0.417
	[0.540]	[0.626]	[0.744]	[0.964]	[0.027]	[0.378]	[0.479]	[0.345]
Concentration	1.192	2.332	2.098	**1.754***	-0.548	0.011	-0.244	-1.083
	[0.947]	[1.564]	[1.608]	[0.944]	[0.515]	[0.845]	[1.021]	[0.870]
Cost to Income	0.298	0.338	0.202	0.295	0.07	0.155	0.078	0.064
	[0.394]	[0.740]	[0.677]	[0.462]	[0.331]	[0.525]	[0.558]	[0.641]
parent characteristics								
Loan Loss		**-0.858****	-0.632	**-0.539***		-0.677	-0.704	-0.613
		[0.349]	[0.449]	[0.277]		[0.437]	[0.627]	[0.464]
ROE		-0.165	-0.567	-0.264		**-1.353***	0.800	0.245
		[0.636]	[1.034]	[0.732]		[0.783]	[1.442]	[0.780]
Equity		-7.066	-8.713	-3.138		0.849	0.080	0.711
		[4.825]	[6.603]	[6.281]		[2.310]	[2.439]	[2.130]
Liquidity		-1.117	-1.792			0.502	-0.193	
		[1.495]	[1.536]			[0.805]	[0.962]	
Interbank				-0.082				-0.017
				[0.101]				[0.088]
home country								
GDP growth		-3.070	-1.738	-3.230		-3.791	-11.090	-4.157
		[7.390]	[8.138]	[9.684]		[5.355]	[8.737]	[7.433]
Crisis			0.522	0.708			0.240	-0.354
			[0.703]	[1.155]			[0.473]	[0.442]
interactions								
*Crisis*P_Loan Loss*			-2.480	**-2.517****			-0.510	**1.941***
			[1.551]	[0.994]			[0.719]	[1.006]
*Crisis*P_ROE*			-0.758	**-2.568****			-2.793	-1.141
			[1.911]	[1.182]			[1.969]	[1.561]
*Crisis*P_Equity*			0.304	-7.046			0.895	-0.630
			[14.757]	[12.461]			[3.853]	[3.646]
*Crisis*P_Liquidity*			0.703				1.981	
			[4.175]				[1.674]	
*Crisis*P_Interbank*				0.540				0.337
				[0.965]				[0.338]
Constant	-2.156**	-1.170	0.312	-1.282	0.376	-0.031	0.925	1.161
	[0.865]	[1.621]	[1.869]	[1.381]	[0.777]	[1.397]	[1.668]	[0.921]
Observations	421	276	271	297	638	329	295	387
Number of banks	120	77	74	85	149	86	80	85
R-squared	0.035	0.046	0.06	0.081	0.027	0.036	0.046	0.027

The table reports the fixed effects panel estimation results. The dependent variable is ΔLoans, yearly change in loans measured as the first difference of the log of total loans. The first (second) four specifications report the results for the sample with an interbank ratio below (above) its median. Third and fourth specifications in both groups exclude the Asian parents. All variable definitions are presented in Table 1. Robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 5 Market Discipline

	ΔTime Deposits					ΔBank Deposits			Interest Rate			
	FE	FE	RE	FE	RE	FE	FE	FE	FE	FE	RE	FE
subsidiary characteristics												
Loan Loss	0.013	-0.015	-0.057	-0.053	-0.07	0.075	0.122	0.131	**0.011***	**0.020*****	**0.021*****	**0.025*****
	[0.049]	[0.084]	[0.058]	[0.091]	[0.069]	[0.124]	[0.184]	[0.212]	[0.006]	[0.007]	[0.006]	[0.007]
ROE	0.004	-0.179	-0.15	**-0.275***	**-0.252***	-0.16	**-0.361*****	**-0.369*****	0.006	-0.016	-0.019	-0.019
	[0.057]	[0.140]	[0.120]	[0.147]	[0.146]	[0.118]	[0.107]	[0.099]	[0.012]	[0.017]	[0.017]	[0.020]
Equity	-0.256	1.556	0.657	1.886	0.714	**-0.931***	-0.839	**-1.253***	0.05	-0.033	0.027	0.001
	[1.016]	[1.279]	[0.713]	[1.360]	[0.784]	[0.527]	[0.615]	[0.704]	[0.069]	[0.071]	[0.099]	[0.079]
Liquidity	**0.400***	-0.099	-0.267	-0.071	-0.277	0.000	-0.517	-0.414	**-0.113****	0.004	0.019	0.004
	[0.219]	[0.590]	[0.312]	[0.611]	[0.338]	[0.182]	[0.324]	[0.315]	[0.053]	[0.018]	[0.027]	[0.019]
Size	-0.072	0.110	0.012	0.203	0.011	0.007	-0.085	-0.091	**-0.012***	**-0.019*****	-0.006	**-0.013***
	[0.083]	[0.125]	[0.034]	[0.149]	[0.044]	[0.070]	[0.120]	[0.137]	[0.007]	[0.007]	[0.004]	[0.007]
host country												
GDP growth	**3.680*****	**2.818***	**3.524****	2.824	**3.580****	2.838	**5.667***	**5.887***	**-0.608****	**-0.315*****	**-0.352*****	**-0.303****
	[1.065]	[1.631]	[1.493]	[1.955]	[1.711]	[2.214]	[3.146]	[3.087]	[0.259]	[0.112]	[0.124]	[0.126]
Exchange rate	**0.106*****	0.151	0.014	0.031	0.050	**0.119*****	0.151	0.071	-0.002	-0.023	-0.008	-0.007
	[0.033]	[0.287]	[0.105]	[0.323]	[0.117]	[0.013]	[0.516]	[0.537]	[0.004]	[0.025]	[0.015]	[0.029]
Concentration	-0.143	0.946	0.142	**1.678***	0.152	-0.115	-0.050	0.193	0.061	0.008	0.031	0.013
	[0.832]	[0.778]	[0.287]	[0.909]	[0.326]	[0.676]	[1.080]	[1.109]	[0.084]	[0.052]	[0.036]	[0.057]
Developed			0.080		0.062						**-0.063*****	
			[0.125]		[0.144]						[0.023]	
Deposit insurance			0.190		0.145						-0.015	
			[0.137]		[0.241]						[0.039]	
parent characteristics												
Loan Loss		-0.402	-0.240	**-1.094****	-0.338		0.210	0.247		**0.025***	0.011	**0.048****
		[0.311]	[0.169]	[0.473]	[0.263]		[0.406]	[0.448]		[0.015]	[0.012]	[0.023]
ROE		-0.346	-0.107	-1.369	-0.517		0.152	-2.461		0.022	0.006	0.053
		[0.306]	[0.267]	[1.269]	[0.835]		[0.447]	[1.490]		[0.020]	[0.018]	[0.075]
Equity		-1.054	-1.974	-1.930	**-2.800***		0.730	0.792		0.155	0.090	0.183
		[1.722]	[1.314]	[1.767]	[1.429]		[1.360]	[1.246]		[0.159]	[0.165]	[0.162]
Liquidity		0.709	-0.099	**1.622****	0.226		0.596	**2.294****		-0.059	0.017	-0.075
		[0.779]	[0.532]	[0.800]	[0.610]		[1.114]	[1.137]		[0.068]	[0.055]	[0.075]

Table 5 continued

	ΔTime Deposits					ΔBank Deposits			Interest Rate			
	FE	FE	RE	FE	RE	FE	FE	FE	FE	FE	RE	FE
home country												
GDP growth		**8.251*** **	**6.910** **	7.189	**7.350***		-6.344	-5.729		-0.104	-0.117	-0.199
		[2.758]	[2.772]	[4.852]	[3.855]		[4.487]	[6.594]		[0.255]	[0.253]	[0.350]
Crisis				-0.745	-0.298			**1.501** **				-0.022
				[0.528]	[0.399]			[0.600]				[0.029]
interactions												
*Crisis*P_Loan Loss*				0.810	0.249			**-1.962** **				**0.125** **
				[1.018]	[0.759]			[0.975]				[0.062]
*Crisis*P_ROE*				**2.822***	1.412			1.411				-0.002
				[1.444]	[0.969]			[1.748]				[0.074]
*Crisis*P_Equity*				5.421	2.923			-1.831				-0.138
				[3.733]	[3.485]			[5.223]				[0.293]
*Crisis*P_Liquidity*				-1.367	-0.673			**-9.143*** **				0.010
				[1.602]	[1.327]			[2.965]				[0.078]
Constant	0.397	-1.849*	-0.529	-2.763**	-0.449	-0.001	0.593	0.565	0.186**	0.264***	0.179***	0.211***
	[0.950]	[0.975]	[0.356]	[1.125]	[0.439]	[0.687]	[1.045]	[1.263]	[0.084]	[0.054]	[0.057]	[0.061]
Observations	1254	671	671	608	608	1328	793	743	1664	971	971	880
Number of banks	239	148	148	136	136	250	164	154	286	186	186	171
R-squared	0.022	0.034	0.063	0.050	0.065	0.008	0.019	0.048	0.057	0.030	0.052	0.038
Hausman test												
Chi2			7.050		13.720						11.560	
p-value			0.900		0.747						0.564	

The table reports the fixed effects and random effects panel estimation results. The dependent variables are ΔTime Deposits, yearly change in time deposits, ΔBank Deposits, yearly change in bank deposits and Interest Rates, measured as total interest rate expenses to total interest bearing deposits. The last two specifications in the first panel and the last specifications in the other panels exclude the Asian parents. All variable definitions are presented in Table 1. Robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%

Table 6 Market Discipline in Developing Countries

	ΔTime Deposits			ΔBank Deposits			Interest Rate		
	1	2	3	1	2	3	1	2	3
subsidiary characteristics									
Loan Loss	-0.015	-0.098	**-0.154***	0.133	0.342	0.331	0.009	**0.023****	**0.030*****
	[0.042]	[0.081]	[0.090]	[0.173]	[0.280]	[0.342]	[0.006]	[0.010]	[0.011]
ROE	-0.028	-0.266	**-0.429****	-0.122	**-0.292*****	**-0.299*****	0.006	-0.019	-0.021
	[0.052]	[0.172]	[0.165]	[0.122]	[0.090]	[0.085]	[0.012]	[0.018]	[0.021]
Equity	-0.751	1.669	2.351	-0.794	-0.21	-1.092	0.101	-0.007	0.029
	[1.125]	[1.633]	[1.735]	[0.772]	[1.047]	[1.083]	[0.090]	[0.115]	[0.127]
Liquidity	0.44	0.835	0.818	-0.19	-0.205	-0.027	-0.002	0.008	0.01
	[0.371]	[0.570]	[0.613]	[0.378]	[0.596]	[0.592]	[0.030]	[0.030]	[0.030]
Size	-0.107	0.196	**0.355***	-0.019	-0.103	-0.234	-0.006	**-0.021****	-0.013
	[0.126]	[0.176]	[0.204]	[0.088]	[0.153]	[0.167]	[0.009]	[0.009]	[0.009]
host country									
GDP growth	**3.508*****	1.383	1.585	3.28	**6.410***	**5.978***	**-0.714****	**-0.361*****	**-0.341****
	[1.099]	[1.319]	[1.555]	[2.403]	[3.448]	[3.128]	[0.285]	[0.121]	[0.135]
Exchange rate	**0.095*****	0.313	0.192	**0.114*****	0.961	0.775	-0.001	-0.043	-0.023
	[0.027]	[0.294]	[0.351]	[0.013]	[0.749]	[0.860]	[0.003]	[0.046]	[0.047]
Concentration	-0.65	1.269	1.940	-0.607	-0.068	0.662	0.133	-0.018	0.014
	[1.344]	[1.058]	[1.299]	[0.884]	[1.719]	[1.530]	[0.115]	[0.073]	[0.083]
parent characteristics									
Loan Loss		-0.288	**-1.300***		0.295	0.387		**0.037***	**0.054***
		[0.411]	[0.725]		[0.585]	[0.542]		[0.021]	[0.031]
ROE		-0.16	-1.553		0.314	-2.582		0.041	0.133
		[0.530]	[1.613]		[1.122]	[1.641]		[0.035]	[0.099]
Equity		-2.802	-3.954		2.693	2.325		0.231	0.283
		[2.790]	[2.858]		[2.051]	[1.524]		[0.245]	[0.247]
Liquidity		1.356	1.987		-0.030	1.856		-0.037	-0.072
		[1.296]	[1.312]		[1.567]	[1.443]		[0.082]	[0.094]
home country									
GDP growth		**13.669*****	**12.692****		**-13.376***	-8.797		-0.146	-0.402
		[3.969]	[5.270]		[7.621]	[7.949]		[0.534]	[0.537]
Crisis			**-1.143****			**1.878****			0.005
			[0.484]			[0.904]			[0.046]
interactions									
*Crisis*P_Loan Loss*			**2.009***			-1.674			0.128
			[1.111]			[1.121]			[0.084]
*Crisis*P_ROE*			**3.582****			3.084			-0.132
			[1.771]			[2.457]			[0.113]
*Crisis*P_Equity*			4.158			-0.91			-0.370
			[4.366]			[8.270]			[0.501]
*Crisis*P_Liquidity*			0.177			**-11.284*****			-0.066
			[1.351]			[3.847]			[0.160]
Constant	0.955	-2.865**	-4.057**	0.493	0.277	0.789	0.103	0.299***	0.221**
	[1.489]	[1.302]	[1.561]	[0.810]	[1.596]	[1.715]	[0.100]	[0.075]	[0.087]
Observations	798	424	387	847	497	481	1047	613	576
Number of banks	161	96	90	162	102	98	185	114	108
R-squared	0.025	0.055	0.081	0.011	0.033	0.078	0.034	0.037	0.049

The table reports the fixed effects panel estimation results for developing countries. The dependent variables are ΔTime Deposits, yearly change in time deposits, ΔBank Deposits, yearly change in bank deposits and Interest Rates, measured as total interest rate expenses to total interest bearing deposits. The third specification in each panel excludes the Asian parents. All variable definitions are presented in Table 1. Robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%

Table 7 Market Discipline in Developed Countries

	ΔTime Deposits			ΔBank Deposits			Interest Rate		
	1	2	3	1	2	3	1	2	3
subsidiary characteristics (lagged)									
Loan Loss	0.158	0.125	0.095	-0.034	-0.146	-0.152	**0.013*** **	**0.015*** **	**0.013*** **
	[0.160]	[0.232]	[0.251]	[0.086]	[0.091]	[0.098]	[0.005]	[0.004]	[0.005]
ROE	**0.993***	0.16	-0.071	-0.565	-0.931	-1.201	0.039	**0.078***	0.055
	[0.579]	[0.560]	[0.607]	[0.565]	[0.565]	[0.806]	[0.039]	[0.039]	[0.040]
Equity	1.175	**3.689*** **	**2.957***	-1.311	-0.468	-0.316	0.025	-0.078	-0.02
	[1.886]	[1.299]	[1.691]	[1.084]	[0.984]	[1.166]	[0.089]	[0.064]	[0.034]
Liquidity	0.173	**-1.341*** **	**-1.100***	0.105	-0.598	-0.435	**-0.156*** **	0.001	0.000
	[0.273]	[0.440]	[0.568]	[0.194]	[0.471]	[0.419]	[0.044]	[0.013]	[0.012]
Size	-0.054	0.041	0.007	0.033	0.062	0.221	-0.009	-0.012	-0.003
	[0.105]	[0.106]	[0.127]	[0.151]	[0.239]	[0.272]	[0.006]	[0.009]	[0.005]
host country									
GDP growth	6.159	8.522	9.122	-0.875	2.333	2.347	-0.348	-0.091	-0.048
	[3.955]	[6.824]	[7.336]	[3.644]	[7.382]	[12.550]	[0.222]	[0.152]	[0.213]
Exchange rate	0.428	-0.223	-0.55	0.21	-0.747	-0.129	0.001	**0.030** **	0.022
	[0.441]	[0.597]	[0.680]	[0.457]	[0.601]	[0.674]	[0.020]	[0.015]	[0.014]
Concentration	0.710	0.574	1.278	0.595	-0.011	-0.63	-0.049	0.064	0.009
	[0.613]	[1.061]	[1.520]	[0.989]	[0.915]	[1.362]	[0.079]	[0.058]	[0.034]
parent characteristics (lagged)									
Loan Loss		**-0.624***	-0.950		0.021	-0.269		0.003	0.037
		[0.341]	[0.585]		[0.271]	[0.554]		[0.017]	[0.034]
ROE		-0.552	-1.640		0.080	-1.132		-0.014	-0.115
		[0.333]	[2.275]		[0.364]	[3.078]		[0.020]	[0.113]
Equity		0.025	-0.158		-1.391	-1.883		-0.039	-0.070
		[2.174]	[2.245]		[1.072]	[1.216]		[0.054]	[0.049]
Liquidity		0.784	2.274		0.986	2.220		-0.122	-0.135
		[0.953]	[1.646]		[1.216]	[1.398]		[0.111]	[0.114]
home country									
GDP growth		0.078	-0.589		-1.362	-8.462		-0.097	-0.005
		[5.262]	[10.662]		[6.370]	[17.051]		[0.145]	[0.230]
Crisis			0.710			0.673			-0.011
			[1.039]			[0.926]			[0.021]
interactions									
*Crisis*P_Loan Loss*			-3.770			**-3.841***			0.037
			[2.957]			[2.011]			[0.030]
*Crisis*P_ROE*			0.951			0.289			0.149
			[2.665]			[3.014]			[0.117]
*Crisis*P_Equity*			3.569			-0.958			-0.117
			[7.231]			[5.376]			[0.110]
*Crisis*P_Liquidity*			-4.004			-6.77			-0.016
			[2.740]			[4.272]			[0.053]
Constant	-0.792	-0.835	-0.708	-0.712	0.428	-0.956	0.194***	0.115**	0.090*
	[0.786]	[1.369]	[1.291]	[1.600]	[1.741]	[1.914]	[0.070]	[0.045]	[0.047]
Observations	460	247	221	484	296	262	624	358	304
Number of banks	80	52	46	89	62	56	104	72	63
R-squared	0.038	0.077	0.107	0.007	0.019	0.052	0.273	0.078	0.077

The table reports the fixed effects panel estimation results for developed countries. The dependent variables are ΔTime Deposits, yearly change in time deposits, ΔBank Deposits, yearly change in bank deposits and Interest Rates, measured as total interest rate expenses to total interest bearing deposits. The third specification in each panel excludes the Asian parents. All variable definitions are presented in Table 1. Robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%

Table 8 Market Discipline and Interbank Dependency

	Interbank<1						Interbank>1					
	ΔTime Deposits			Interest Rate			ΔTime Deposits			Interest Rate		
	1	2	3	1	2	3	1	2	3	1	2	3
subsidiary characteristics												
Loan Loss	-0.072	0.058	0.084	0.013	0.040	0.050	0.003	**-0.232****	**-0.263****	0.011	0.018	0.020
	[0.095]	[0.240]	[0.296]	[0.013]	[0.030]	[0.031]	[0.075]	[0.108]	[0.113]	[0.007]	[0.014]	[0.012]
ROE	-0.295	-0.346	-0.454	-0.004	-0.003	-0.001	-0.002	-0.174	-0.248	0.012	-0.040	-0.07
	[0.198]	[0.299]	[0.349]	[0.007]	[0.010]	[0.010]	[0.050]	[0.260]	[0.354]	[0.016]	[0.040]	[0.058]
Equity	**-4.509*****	**-7.582****	**-7.096***	0.016	-0.020	0.004	1.748	**3.539***	**4.356****	0.154	0.040	0.081
	[1.161]	[3.748]	[4.033]	[0.097]	[0.291]	[0.293]	[1.218]	[2.037]	[2.124]	[0.118]	[0.112]	[0.119]
Liquidity	0.934	1.302	1.137	0.013	0.013	0.016	0.297	0.946	0.823	-0.009	-0.003	-0.010
	[0.592]	[0.890]	[0.820]	[0.020]	[0.024]	[0.028]	[0.527]	[0.867]	[1.002]	[0.054]	[0.060]	[0.074]
Size	-0.028	0.036	0.193	-0.013	-0.021	-0.013	0.027	0.240	0.463	0.019	0.009	0.008
	[0.207]	[0.265]	[0.323]	[0.013]	[0.025]	[0.026]	[0.132]	[0.243]	[0.304]	[0.015]	[0.014]	[0.018]
host country												
GDP growth	-0.614	-2.157	-2.567	**-0.364****	**-0.460*****	**-0.426****	**4.454*****	2.264	2.353	-0.926*	-0.125	-0.152
	[1.672]	[2.346]	[2.494]	[0.148]	[0.162]	[0.178]	[1.515]	[2.468]	[3.463]	[0.498]	[0.343]	[0.411]
Exchange rate	0.618	-0.189	0.099	-0.026	0.019	0.031	**0.084*****	0.630	0.579	0.001	-0.075	-0.004
	[0.486]	[0.670]	[0.551]	[0.048]	[0.050]	[0.057]	[0.018]	[0.516]	[0.607]	[0.003]	[0.059]	[0.067]
Concentration	0.674	-1.701	-1.049	-0.001	-0.056	-0.042	-0.721	2.450	5.232**	0.175	-0.145	-0.140
	[1.343]	[2.557]	[2.430]	[0.066]	[0.097]	[0.104]	[1.363]	[1.632]	[2.272]	[0.192]	[0.127]	[0.169]
parent characteristics												
Loan Loss		**-2.321****	**-2.897*****		-0.014	0.012		0.231	-0.033		**0.065****	0.081
		[1.072]	[1.035]		[0.037]	[0.047]		[0.173]	[0.440]		[0.028]	[0.060]
ROE		0.308	-0.057		-0.116	-0.116		0.388	-3.206		0.106*	**0.638****
		[1.272]	[2.150]		[0.103]	[0.126]		[0.407]	[2.873]		[0.058]	[0.314]
Equity		8.491	9.877		-0.587	-0.224		-3.881	**-6.099*****		0.103	0.073
		[8.952]	[10.407]		[0.990]	[0.779]		[2.457]	[2.107]		[0.233]	[0.250]
Liquidity		1.044	1.195		-0.164	-0.159		-0.923	-0.455		0.042	-0.094
		[4.854]	[6.957]		[0.189]	[0.183]		[2.085]	[2.244]		[0.191]	[0.208]
home country												
GDP growth		**15.025***	14.852		-0.948	-1.063		**13.752****	18.771		0.613	0.285
		[8.255]	[9.230]		[0.599]	[0.664]		[6.634]	[11.333]		[0.913]	[1.060]
Crisis			-0.596			0.045			**-1.784*****			-0.015
			[1.276]			[0.080]			[0.604]			[0.075]
interactions												
*Crisis*P_Loan Loss*			**4.818****			0.016			1.115			0.123
			[2.310]			[0.152]			[0.827]			[0.110]
*Crisis*P_ROE*			1.489			-0.002			5.323			-0.343
			[2.421]			[0.168]			[3.508]			[0.316]
*Crisis*P_Equity*			-2.719			-0.716			**12.418*****			0.111
			[8.754]			[0.758]			[4.648]			[0.628]
*Crisis*P_Liquidity*			1.170			-0.150			-0.206			0.190
			[5.725]			[0.259]			[1.737]			[0.181]
Constant	0.201	0.585	-0.957	0.216**	0.397*	0.307	-0.314	-4.077**	-6.694***	-0.076	0.149	0.097
	[1.427]	[2.844]	[3.229]	[0.084]	[0.228]	[0.205]	[1.293]	[1.663]	[2.055]	[0.181]	[0.118]	[0.146]
Observations	293	177	173	425	283	279	505	247	214	622	330	297
Number of banks	98	62	59	123	81	78	124	71	65	146	86	80
R-squared	0.076	0.164	0.198	0.029	0.063	0.073	0.042	0.112	0.166	0.044	0.03	0.058

The table reports the fixed effects panel estimation results for developing countries. The dependent variables are ΔTime Deposits, yearly change in time deposits, ΔBank Deposits, yearly change in bank deposits and Interest Rates, measured as total interest rate expenses to total interest bearing deposits. The first (second) six specifications report the results for the sample with an interbank ratio below (above) its median. The third specification in each panel excludes the Asian parents. All variable definitions are presented in Table 1. Robust standard errors are in parentheses. *** significant at 1%, ** significant at 5%, * significant at 10%

Appendix
Table A1

Name of parent bank	Country of origin	Number of subsidiaries
Allied Irish Banks plc	IRELAND	1
Alpha Bank AE	GREECE	5
Australia and New Zealand Banking Group	AUSTRALIA	5
BNP Paribas	FRANCE	19
Banca Monte dei Paschi di Siena SpA	ITALY	3
Banco Bilbao Vizcaya Argentaria SA	SPAIN	6
Banco Santander SA	SPAIN	15
Bank of America, National Association	USA	9
Barclays plc	UNITED KINGDOM	15
Bayerische Landesbank	GERMANY	10
Citibank NA	USA	51
Commerzbak AG	GERMANY	6
Commonwealth Bank of Australia	AUSTRALIA	1
Credit Suisse Group	SWITZERLAND	9
CrÈdit Agricole S.A.	FRANCE	15
DBS Group Holdings Ltd	SINGAPORE	4
Danske Bank A/S	DENMARK	4
Deutsche Bank AG	GERMANY	20
Deutsche Zentral-Genossenschaftsbank AG	GERMANY	2
Dexia Bank-Dexia Bank Belgium	BELGIUM	9
DnB Nor ASA	NORWAY	4
Dresdner Bank AG	GERMANY	9
EFG Eurobank Ergasias SA	GREECE	5
Erste Group Bank AG	AUSTRIA	8
Fortis	BELGIUM	5
HSBC Holdings Plc	UNITED KINGDOM	29
ING Bank NV	NETHERLANDS	9
Intesa Sanpaolo	ITALY	8
JP Morgan Chase Bank, NA	USA	16
KBC Bank NV	BELGIUM	7
Kabushiki Kaisha Mitsubishi UFJ Financial Group-Mitsubishi UFJ Financial Group Inc	JAPAN	16
Kookmin Bank	KOREA REP. OF	3
Landesbank Baden-Wuerttemberg	GERMANY	1
Millennium bcp-Banco Comercial PortuguÍs, SA	PORTUGAL	6
Mizuho Financial Group	JAPAN	8
Nordea Bank AB (publ)	SWEDEN	4
Rabobank Nederland	NETHERLANDS	10
Raiffeisen Zentralbank Oesterreich AG - RZB	AUSTRIA	14
Royal Bank of Scotland Group Plc (The)	UNITED KINGDOM	10
Shinhan Bank	KOREA REP. OF	5
Skandinaviska Enskilda Banken AB	SWEDEN	6
SociÈtÈ GÈnÈrale	FRANCE	11
Standard Chartered Plc	UNITED KINGDOM	26
Sumitomo Mitsui Financial Group, Inc	JAPAN	7
Svenska Handelsbanken	SWEDEN	2
Swedbank AB	SWEDEN	5
UBS AG	SWITZERLAND	13
UniCredit SpA	ITALY	15
WestLB AG	GERMANY	8
Westpac Banking Corporation	AUSTRALIA	5
Woori Bank	KOREA REP. OF	3

Table A2

Country	Number of subsidiaries	Country	Number of subsidiaries
Albania	2	Lebanon	2
Angola	1	Lithuania	5
Argentina	9	Macedonia	1
Armenia	2	Madagascar	1
Australia	5	Malaysia	7
Austria	5	Mauritania	1
Belgium	12	Mauritius	2
Bolivia	1	Mexico	11
Bosnia and Herzegovina	5	Montenegro	1
Botswana	2	Morocco	2
Brazil	16	Mozambique	1
Bulgaria	8	Nepal	1
Cambodia	1	Netherlands	9
Cameroon	2	New Zealand	4
Canada	13	Nicaragua	1
Chile	11	Nigeria	1
China	9	Norway	3
Colombia	5	Pakistan	2
Congo, Dem. Rep.	1	Panama	10
Costa Rica	2	Papua New Guinea	2
Croatia	6	Paraguay	4
Czech Republic	8	Peru	4
Denmark	3	Philippines	2
Dominican Republic	1	Poland	22
Ecuador	1	Portugal	5
Egypt, Arab Rep.	5	Romania	7
El Salvador	2	Russian Federation	26
Equatorial Guinea	1	Serbia	10
Estonia	2	Sierra Leone	1
Finland	1	Singapore	3
France	13	Slovak Republic	6
Gabon	1	Slovenia	4
Gambia, The	1	Spain	12
Germany	15	Taiwan	2
Ghana	2	Tanzania	3
Greece	1	Thailand	2
Guatemala	1	Tonga	1
Honduras	2	Trinidad and Tobago	1
Hong Kong	6	Tunisia	1
Hungary	12	Turkey	6
India	6	Uganda	3
Indonesia	10	Ukraine	8
Ireland	13	United Kingdom	14
Italy	6	Uruguay	5
Ivory Coast	2	Usa	14
Japan	1	Venezuela	2
Kazakhstan	2	Vietnam	1
Kenya	3	Zambia	3
Korea, Rep.	2	Zimbabwe	2
Latvia	5		