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Follow the Money: Quantifying Domestic Effects  
of Foreign Bank Shocks in the Great Recession

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## **Follow the Money: Quantifying Domestic Effects of Foreign Bank Shocks in the Great Recession**

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### **Abstract**

Foreign banks pulled significant funding from their U.S. branches during the Great Recession. We estimate that the average-sized branch experienced a 12 percent net internal fund “withdrawal,” with the fund transfer disproportionately bigger for larger branches. This internal shock to the balance sheets of U.S. branches of foreign banks had sizable effects on their lending. On average, for each dollar of funds transferred internally to the parent, branches decreased lending supply by about forty to fifty cents. However, the extent of the lending effects was very different across branches, depending on their precrisis modes of operation in the United States.

Key words: bank, global, liquidity, transmission, capital markets, crisis, branch

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# Follow the Money. Quantifying Domestic Effects of Foreign Bank Shocks in the Great Recession

Nicola Cetorelli and Linda S. Goldberg

The financial crises have focused considerable academic and policy attention on the roles of foreign banks in transmitting shocks and creating vulnerability for host or parent countries. Adverse consequences are presumed and a premise of their destabilizing behavior, in particular surrounding the branches of foreign banks, has taken hold.

Global banks actively allocate funds across their banking organizations, in normal times and in stress periods (Cetorelli and Goldberg forthcoming). During the Great Recession, some foreign locations of U.S. banks were “core investment markets” that continued as destinations for funding, while other foreign locations served as “core funding markets” that would send even larger net flows to their parent banks following parent balance sheet disturbances (Cetorelli and Goldberg 2011b). In this paper we provide complementary evidence focusing on the perspective of a *host* country. We analyze the activity of foreign banks in the United States through the operations of their local branches. Honing in on this particular set of banks we have access to a level of data detail on foreign banking activity otherwise unavailable. Taking advantage of this rich information we identify a funding shock to branch *parents* and then trace the impact on the U.S. branches’ balance sheet, quantifying the potential internal fund transfer in support of the parent, and then the related dollar effect on their lending activity. We confirm our previous finding that internal capital markets are at play in response to parent bank funding shocks and find evidence of a sizeable impact on branch lending supply.<sup>2</sup> However, the data also indicates that the balance sheet adjustments of such branches are highly heterogeneous. Branch size

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<sup>2</sup> Peek and Rosengren (1997) earlier identified the transmission of Japanese shocks to U.S. borrowers by examining U.S. localities with different degrees of Japanese bank penetration.

matters significantly for both the intensity of the internal capital market response of the branch to a parent shock and for the intensity of the subsequent contraction of loan supply to branch customers. Moreover, ex ante indicators of the level of parent bank "commitment" to the local market matter substantially in how much a parent bank shock gets transmitted to internal and external branch lending.

## I. Foreign bank branches in the United States

We use regulatory reporting data<sup>3</sup> filed quarterly by U.S. branches and agencies of foreign banks<sup>4</sup> for the period 2006q2 through 2009q4. Over this period there are 162 independent bank families, with a total of 241 branches filing regulatory reports (Table 1). They account together for about one fifth of total U.S. banking assets, but the asset size distribution of these branches is wide, with the median size under \$1 billion and the mean over \$7 billion. About 40 percent of their balance sheets are comprised of loans, although branches differ substantially in how much of this lending is, for instance, to commercial and industrial (C&I) activity and how much is directed to U.S. domestic customers. Branches also differ in balance sheet liquidity, with smaller banks less liquid, and differ in the degree to which they borrow and lend internally with their affiliates in the United States and abroad.<sup>5</sup> Prior to the crisis, about 20 percent of the foreign families with U.S. branches also were present in the U.S. with one or more locally chartered bank subsidiaries.

[Insert Table 1 here]

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<sup>3</sup> This is the Federal Financial Institutions Examinations Council (FFIEC) Report of Assets and Liabilities of U.S. Branches and Agencies of Foreign Banks (FFIEC 002).

<sup>4</sup> Foreign bank branches and agencies are legal extensions of their parent companies, and they do not have any regulatory capital of their own. Foreign banks' U.S. subsidiaries instead are freestanding legal entities with U.S. or state charters and their own capital (<http://www.newyorkfed.org/aboutthefed/fedpoint/fed26.html>).

<sup>5</sup> Internal capital market transactions are captured by reported data on "Net Due From" related depository institutions (a branch asset) or "Net Due To" (a branch liability).

## II. Tracing local balance sheet exposure to a foreign parent bank shock

Our proxy for the funding shock to the parent bank is the degree to which each parent had accumulated exposure to asset backed commercial paper (ABCP) conduits prior to the crisis. This exposure as a percentage of equity capital is presented in Acharya, Schnabl and Suarez (Forthcoming) and shown to be a very good ex ante indicator of the subsequent funding difficulties experienced in the aftermath of the crisis.<sup>6</sup> As displayed in Table 1, the population of foreign families exhibited substantial differences in their ex ante ABCP exposure.

Using foreign families' ABCP exposure as the starting point, we first estimate the degree to which U.S. branches contributed to support the parents' funding needs. The analysis takes the form of a difference-in-difference identification strategy: we compare the pre-post crisis balance sheet adjustments but and look for a differential response across branches, depending on their parent's pre-crisis exposure to ABCP conduits. The prior is that parents with higher ex ante ABCP exposure would withdraw more funds from their U.S. branches. The basic testing specification is therefore the following:

$$(1) \Delta Net Due To_{ijt} = \beta_0 + \beta_1 \cdot X_{ijt} + \beta_2 \cdot ABCP Exposure_{it} + \beta_3 \cdot ABCP Exposure_{it} \cdot X_{ijt} + \varepsilon_{ijt}$$

where  $\Delta Net Due To_{ijt}$  is the change in branch  $j$  net internal borrowing from parent organization  $i$  over the pre-post interval  $t$ . It is measured as the change from pre-crisis quarters – where we smooth out quarterly variability by taking an average, calculated over 2006Q2 through 2007Q2 – and post crisis quarters – as averages over the period 2008Q3 through 2009Q4.<sup>7</sup> A negative number expresses the dollar amount of net internal funding “withdrawal” by the parent from the

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<sup>6</sup> Likewise, it is shown as an effective indicator of funding shock and subsequent driver of internal funding dynamics for U.S. global banks (Cetorelli and Goldberg, 2011b).

<sup>7</sup> This type of specification is used in Khwaja and Mian (2008) and is similar to Cetorelli and Goldberg (2011a). We exclude the in-between quarters from 2007Q3 and 2008Q2 to obtain a clean cut definition of the post period, to start right after the Lehman Brother's collapse, while still maintaining a likewise clean definition of the pre-crisis period, ending before August 2007.

branch.  $ABCP\ Exposure_{it}$  is the ratio of exposure to equity as of December 31, 2006 for each parent  $i$  (and is therefore common across  $j$  branches for multi-branch parents).<sup>8</sup> The level of ABCP exposure accumulated in the pre-crisis quarters, especially its level compared to total equity, is considered as determined by the parent on the basis of broad organization-wide strategic considerations and not driven by balance sheet characteristics of the U.S.-based branches. This implies we can consider the parent exposure ratio as a legitimate treatment and any differential ex-post balance sheet effects we may find are unlikely to be driven by confounding simultaneous changes in local (U.S.) market conditions. The  $X_{ijt}$  vector includes branch control pre-determined variables, calculated as quarterly averages between 2006Q2 and 2007Q2. We focus on branch size, arguing that size should be a main factor determining the contribution to liquidity management of the global banking organization.

The subsequent step is to trace the potential transmission to the asset side of branches' balance sheet of the specific change in branch net internal liabilities driven by the parents' funding needs. The second stage estimates are derived from the model specification

$$(2) \Delta L_{ijt} = \gamma_0 + \gamma_1 \cdot \Delta Net\ Due_{ijt}(\text{Predicted}) + \gamma_2 \cdot \Delta Net\ Due_{ijt}(\text{Predicted}) \cdot Z_{ijt} + \gamma_3 \cdot Z_{ijt} + \nu_{ijt}$$

where  $\Delta L_{ijt}$  is the change in lending pre-post crisis, calculated with the same criterion as for the previous dependent variable. In order to account for potential systematic differences in lending investment across branches, we use three distinct loan aggregates: total loans, commercial and industrial loans, and loans to domestic addressees.  $\Delta Net\ Due_{ijt}(\text{Predicted})$  is the series of predicted values from the estimation of equation (1). This series should capture that component of the broader observed change in branch net internal liabilities specifically tied to the parent's

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<sup>8</sup> We thank Philipp Schnabl and Viral Acharya for kindly providing the ABCP exposure data.

funding need.<sup>9</sup> The vector  $Z_{ijt}$  includes both size controls and other variables that should capture the differential mode of operation of each branch.

More specifically, we conjecture that the extent to which a local branch in the United States is used for active global liquidity management by the foreign parent is likely to depend on the degree to which the parent is committed – from an investment perspective – to the local market. To test this conjecture, we identify four proxies of business model. The first three proxies are derived directly from the balance sheet of the branches. First, on the funding side, we look at the relative reliance by the branch – in normal times – on internal borrowing from the rest of the organization. A branch that has a high proportion of its total liabilities represented by internal borrowing may operate with weaker funding ties to the local market in which it is established. A smaller focus on raising local funds may indicate a branch mainly used for global liquidity management purposes. Second, and now from the asset side of the balance sheet, we look at the ratio of liquid assets to total assets. Irrespective of the source of borrowing, the choice of a branch to keep funds “idle” rather than immobilized long term may indicate a strategy where more funds remain available to accommodate the liquidity needs of the rest of the organization. A third measure is the ratio of domestic lending to total assets. A high ratio of lending to U.S. addressees may be an indication of a branch that is more committed to local investments and therefore would have funds that are less available to the rest of the organization. However, a higher ratio may also indicate a higher degree of immobilization of funds, which may imply stronger transmission in the event of a shock on the liability side.

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<sup>9</sup> Hence, equation (2) is estimated as the second stage of a 2SLS regression where the right hand side of equation (1) are the instruments for  $\Delta \text{Net Due To}_{ijt}$ . Recall that a positive change in this internal capital markets measure reflects either an increase in branch borrowing from the parent organization or a reduction in branch lending to the rest of the organization.

Our final business model consideration compares foreign banks operating in the United States exclusively using branches with those operating in the United States with both branches and bank subsidiaries. The decision to operate with a subsidiary as well as a branch may indicate a higher overall commitment to the local market. As such, the balance sheet of local branches may be less sensitive to the needs of the parents. On the other hand, it is possible that the foreign parent may treat the subsidiary as its “committed leg” for local investment, while using the branches’ balance sheets more actively for purposes of global liquidity management.

### **III. Results**

Column 1 of Table 2 reports the results of a regression based on specification (1), including total branch assets and assets squared as size controls. Internal capital market transfers are stronger for the branches of parents with higher ex ante ABCP exposure, although with disproportionately larger effects found among the biggest branches. These effects are quantitatively important. For example, an average sized branch (\$7 billion) with a parent ABCP exposure ratio of 1 would experience an average net internal fund withdrawal of about \$343 million. If that branch had ex ante the average level of internal balances (\$2.8 billion), that withdrawal would correspond to about 12 percent of ex ante internal capital market balances of the branch.

[Insert Table 2 here]

Columns 2 through 4 of Table 2 show the results of regressions from specification (2). These regressions can be considered as providing baseline results before turning to the importance of the business model variables. The dependent variables of these regressions are, respectively, the changes in total lending, C&I lending, and lending to U.S. addressees only. The reported results show patterns of lending response to internal capital market transfers to the

parent shock that are noisier for the first two lending categories compared with those on lending to U.S. addresses only. However, all of the results indicate overall a positive and significant link between a change in net internal borrowing and a change in external lending by the branch. We calculate that for each dollar of decrease in internal borrowing (or increase in internal lending to the parent), the total and domestic lending of the median-sized branch decreases, on average, between 40 and 50 cents. The effects on C&I lending for the median-sized branch are somewhat smaller, at 30 to 40 cents for each dollar of decrease in internal borrowing.

In general, the marginal lending transmission of the parent funding shock is smaller for the very largest branches in the United States, suggesting that size affords these branches a degree of access to alternative adjustment mechanisms or funding markets that are not as readily available to the smaller bank branches. This finding is consistent with other research on differences in the lending channel across large and small banks. For example, Kashyap and Stein (2000) argue that larger banks have better access to replacement sources of funds when confronted with a liquidity shock on their balance sheet.

Heterogeneity across branches in lending response. As a final exercise, we run the same specification (2) regressions using total loans as dependent variable and then adding separately the four additional business model indicators described earlier.<sup>10</sup> Within the specifications, the business model variables are allowed to interact with the range of  $\Delta Net Due_{ijt}$  (Predicted) terms, making feasible a comparison of the lending effects for branches with or without related subsidiaries, with high versus low domestic loan shares, liquid assets shares, or related liability

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<sup>10</sup> With the addition of the business model variables, the regressions have triple interaction terms that do not lend themselves to immediate interpretation without calculation of full marginal effects. We report a summary of such calculations in Table 3. The full set of regression results display statistically significant effects of the business model variables and are available from the authors upon request.

shares. As shown in the first data row of Table 3, the addition of the business model variables improves significantly the overall fit of the model. The bottom two rows of this table capture the importance of the four business model proxies, but also continue to capture the importance of branch size itself. We separately report the marginal importance for branches that are in the lower 90<sup>th</sup> percentile of the size distribution and those in the upper 10<sup>th</sup> percentile of the size distribution.

[insert Table 3 here]

Among the smaller branches, those in the lower 90th percentile by asset size, the existence of a related subsidiary implies that, for every dollar of funds transferred to the parent, the contraction in lending is 35 cents larger compared to branches without subsidiaries. Similarly, branches that had ex ante high domestic investment, as proxied by domestic loan share, exhibit a much stronger lending response to transfers of funds to their parent banks. An analogous effect arises for those branches with high ex ante reliance on internal funding from the parent bank. A high liquid asset ratio does not seem to be as important in capturing heterogeneous lending effects.

These differential responses are however smaller for the largest branches (bottom row of Table 3), suggesting that a specific business model orientation is less relevant in capturing balance sheet transmission once size is above a certain threshold.

#### **IV. Conclusions**

Global banking is a well-recognized vehicle of international shock transmission. The management of liquidity on a global scale, with funds flowing internally among bank affiliates located across borders, is one important factor determining such global propagation of local

balance sheet adjustments. This article contributes to further our understanding of global banking funding dynamics by taking a closer view from the perspective of a host country.

Using data on the operations of U.S.-based foreign bank branches, we confirm the existence of an active cross-border, internal capital market. We also demonstrate the quite heterogeneous balance sheet adjustments of such branches and consequences for the local lending markets in which they operate. Branch size matters significantly for both the intensity of the internal capital market response to a parent bank shock and for the intensity of the subsequent adjustment on the investment side of the balance sheet. The choice of the mode of operation in the host country, as reflected by various levels of "commitment" to the local market, also matters substantially in assessing how much a foreign shock gets transmitted internally and to lending in the host country market.

Hence, from the perspective of a host country, macroeconomic transmission may be less a function of overall "openness" to international banking and more of the specific characteristics of individual foreign banks engaged in its economy. These types of insights are relevant in the normative debate around regulation of global banking.

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Table 1: Statistics on US Branches or Agencies of Foreign Parents

	2006Q2-2007Q2	2008Q3-2009Q4	
	median	mean	median
Branch asset size (in billions USD)	0.6	7.2	0.7
Total Loans / Assets (percent)	37	41.6	39.3
Commercial & Industrial Loans / Total Assets (percent)	15.2	23	21.1
Domestic Loans / Total Assets (percent)	9.2	18.4	10
Liquid Assets / Total Assets (percent)	13.6	24.8	16.4
Liabilities to Related Parties / Total Assets (percent)	14.6	31.3	26.2
Liabilities to Related parties / Total Assets (percent, by head)	30.9	39.6	46
ABCP Exposure / Equity (percent, by foreign family)	0	18.2	0
Number of branches		241	232
Number of foreign bank families		162	152
Number of foreign families with banking subsidiaries in US		32	31

Notes: Liquid assets are defined as the sum of cash and balances due from depository institutions, US government and non-US government securities, fed funds sold and securities repurchased under agreements to resell. Domestic loans are constructed as the sum of total real estate loans, and all loans to depository institutions and C & I loans specifically made to US addresses. Liabilities to related parties are calculated as absolute values.

**Table 2: Net Due and Loan Response to Funding Shock**

	$\Delta$ Net Due To (1)	$\Delta$ Loans (2)	$\Delta$ C & I (3)	$\Delta$ Domestic (4)
ABCP Exposure	-0.785 (1.95)			
Assets	-0.337** (0.13)	0.193** (0.06)	0.145** (0.03)	0.138** (0.03)
Assets <sup>2</sup>	0.009** (0.00)	-0.002** (0.00)	-0.001** (0.00)	-0.002** (0.00)
Exposure · Assets	0.213 (0.17)			
Exposure · Assets <sup>2</sup>	-0.007** (0.00)			
Constant	0.122 (0.59)	0.162 (0.25)	0.073 (0.14)	0.057 (0.13)
$\Delta$ Net Due To (predicted)		0.600 (0.46)	0.395 (0.25)	0.465* (0.23)
Assets · $\Delta$ Net Due To (predicted)		-0.02 (0.01)	-0.01 (0.01)	-0.014* (0.01)
Assets <sup>2</sup> · $\Delta$ Net Due To (predicted)		1.26E-04 (0.00)	8.10E-05 (0.00)	1.04E-4* (0.00)
# Observations	223	223	223	223
Adjusted R <sup>2</sup>	0.13	0.08	0.18	0.18

Notes: Coefficient and standard errors reported, \* p <0.01 \*\* p <0.05. Domestic loans are constructed as the sum of total real estate loans, and all loans to depository institutions and C & I loans specifically made to US addresses. Net Due To is constructed as the difference between net due to and net due from related depository institutions and of the reporting branch or agency. All dependent variables and assets are in billions USD. Assets are averaged over the period 2006Q2 -2007Q2.

Table 3: Estimated Economic Significance

	X Business Model Variable			
	Has subsidiary	Share of Domestic Loans	Share of Liquid Assets	Share of Related Liabilities
Incremental Adjusted R <sup>2</sup>	0.14	0.35	0.12	0.25
<b>"High" - "Low" in X</b>				
Average differential change in total loans				
for branches <90 percentile in total assets	0.35	0.53	-0.04	0.59
for branches >90 percentile in total assets	0.11	0.27	-0.20	0.21

Notes: Share of related liabilities is the ratio of own internal borrowing from the rest of the organization to total liabilities. Share of liquid assets is the ratio of liquid assets to total assets. Share of domestic loans is the ratio of lending to US addressees to total assets. The numbers in the bottom two rows are estimates of the differential change in total loan supply between branches with "high" and "low" values in each of the four business model variables in response to a one dollar change of net internal borrowing driven by the parent funding shock. For the subsidiary variable, high/low is a 1/0 dummy. For the other three variables, it refers to 75th and 25th percentile values in each distribution.