

Global Banks' Dynamics and the International Transmission of Shocks

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The presence of foreign institutions in the U.S. banking market is substantial. About 20% of the aggregate assets held by banks operating in the U.S. belongs to banking offices that are ultimately owned by a foreign parent. Deposits and loans display a similar pattern over the last two decades, ranging from 15% of total deposits to 30% of the total commercial and industrial loans in hands of foreign owned banking offices. Foreign institutions can enter the U.S. banking market mostly with subsidiaries or branches. The differences between these two types of affiliates are illustrated in Fillat, Garetto, and Götz (2014). Fundamentally, subsidiaries raise independent equity, are subject to capital requirements, make loans, and receive insured and uninsured deposits. Branches' balance sheet instead is aggregated to the foreign parent bank holding company. Hence, branches do not have independent equity and are not subject to capital requirements by themselves. Branches cannot take uninsured deposits either. Branches can exchange funds intra-firm with their parent, while subsidiaries

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transact with the parent bank at arm's length.

In this paper we explore the relevance of the choice that a foreign bank has when entering the U.S. market for the transmission of shocks across countries, specifically on lending. We consider the effect that the southern European sovereign debt crises (Greece, Italy, Ireland, Spain) caused in European banks with presence in the U.S. and compare the consequences of such shock in the lending behavior of their branches and subsidiaries. We find that branches of European parents who were directly exposed to Greek sovereign debt decrease their assets in the U.S. by 81% while subsidiaries of exposed European parents increased their assets in the U.S. by about 25%. Consistent with this fact, we also find that the probability that a subsidiary sends money to the parent increases by about 44% while the probability that a U.S. branch of an exposed parent sends money back to the European parent increases by more than twice that amount.

The findings in our empirical analysis highlight two specific mechanisms. First, subsidiaries are fully capitalized. Therefore, shocks to the foreign parent do not affect the subsidiary's capital ratios and regulatory requirements. Second, branches exploit the internal capital market to send funds to the parent which, coupled with the capital requirements being at the holding company level, increase the likelihood of the branch to serve as the liquidity provider to the parent in case of need. The liquidity provision channel has been thoroughly documented in Cetorelli and Goldberg (2012), with focus on the intra-firm flows of branches. The authors find that there is a sizeable effect on branch lending. The international transmission of shock mechanism was first explored by Peek and Rosengren (1997). Our goal is to extend the existing analysis and compare how lending activities are affected by an exogenous shock to the balance sheet of the parent bank as a function of their choice of affiliate.

In order to understand the mechanisms underlying the facts, we develop a simple three-period model where banks choose endogenously whether to enter into a foreign market or not, and if so, whether to do it via a subsidiary or a branch. The model equilibrium rationalizes the empirical regularities that we observe in the data for reasonable parameterizations.

1 Quantitative framework

We present the mechanisms at play with a simple three-period version of the model spelled out in Fillat, Garetto, and Götz (2014). The economy is composed of two countries. Each country is populated by a continuum of banks that differ in their management efficiency ($1/a$) and engage in monopolistic competition in the loans market. Banks are endowed with an exogenous amount of equity (E) in the first period and receive insured deposits (D , with insurance premium $f_p \cdot D$). On the asset side, banks extend loans to other banks (M) or to non-financial counterparties (L). Equity accumulates over time through reinvested earnings. Banks decide whether they want to open an affiliate in the foreign country and how. A subsidiary has independent equity and is subject to regulatory capital ratios, while branches aggregate their balance sheet up to the parent. Branches does not accept insured deposits and do not have to pay insurance premium. Finally, opening a subsidiary entails higher fixed costs (F_S) than opening a branch (F_B). A bank opens an affiliate only if it is profitable to do so. Otherwise, it remains a national bank. To capture the effect of the European sovereign debt crisis, we impose that at the end of the second period there is an unexpected shock, whereby the probability of default of the loans in the home country ($(1 - p)$) increases.

A parent-subsidiary pair maximizes:

$$\begin{aligned}
& \max_{\substack{L, D, M \\ L^*, D^*, M^*}} \sum_{t=1}^3 pr_{Lt}(L_t) \cdot L_t - (1-p)L_t + \dots \\
& r_{Mt}M_t - r_{Dt}D_t - aC(D_t, L_t) - f_p \cdot D_t + \dots \\
& p^* r_{L_t^*}^*(L_t^*) \cdot L_t^* - (1-p^*)L_t^* + \dots \\
& r_{Mt}^*M_t^* - r_{Dt}^*D_t^* - aC(D_t^*, L_t^*) - f_p \cdot D_t^* - F_S
\end{aligned}$$

$$s.t. \quad E_t + D_t = L + M$$

$$E_t^* + D_t^* = L^* + M^*$$

$$\frac{E_t}{\omega_L L + \omega_M \mathbb{1}_{M \geq 0} M} \geq k$$

$$\frac{E_t^*}{\omega_L L^* + \omega_M \mathbb{1}_{M^* \geq 0} M^*} \geq k$$

where $aC(\cdot)$ denotes the cost of managing loans and deposits for a bank with efficiency $1/a$.

Similarly, a parent-branch pair maximizes:

$$\begin{aligned}
& \max_{\substack{L, D, M \\ L^*, D^*, M^*, T}} \sum_{t=1}^3 pr_{Lt}(L_t) \cdot L_t - (1-p)L_t + \dots \\
& r_{Mt}M_t - r_{Dt}D_t - aC(D_t, L_t) - f_p \cdot D_t + \dots \\
& p^* r_{L_t^*}^*(L_t^*) \cdot L_t^* - (1-p^*)L_t^* + \dots \\
& r_{Mt}^*M_t^* - r_{Dt}^{*w}D_t^* - aC(D_t^*, L_t^*) - F_B
\end{aligned}$$

$$s.t. \quad E_t + D_t + T = L + M$$

$$E_t^* + Dw_t^* = L^* + M^* + T$$

$$\frac{E_t}{\omega_L(L + L^*) + \omega_M \mathbb{1}_{(M+M^*) \geq 0}(M + M^*)} \geq k$$

where T denotes the possible intra-firm transfers of funds between parent and branch. r_{Dt}^{*w} denotes the interest rate on insured deposits. Consistent with the data, we assume that $r_{Dt}^{*w} > r_{Dt}^* + f_p$. Under this assumption, operating a branch entails lower fixed costs but higher variable costs than opening a subsidiary. As a result, and consistent with the evidence reported in Fillat, Garetto, and Götz (2014), the largest banks open subsidiaries in equilibrium, the next largest open branches, while the smallest banks remain national banks. Also, subsidiaries are on average larger than branches in equilibrium.

What does this framework predict for the response of loans and transfers between parts of the conglomerate in the wake of the sovereign debt crisis? When p suddenly decreases, national banks and parents of branches and subsidiaries see their domestic profits drop, and their equity in the following period is significantly reduced. However, parent-subsidiary pairs react differently compared to parent-branch pairs. Since foreign subsidiaries are separately capitalized, both their L and M loans are isolated from the shock in the Home market and keep growing due to equity accumulation irrespectively of the domestic shock. As domestic equity drops, parents of branches find themselves in need of funding, and the cheapest way to obtain funds is through intrafirm transfers from their branches: as such, the probability of positive intrafirm transfers from branches to parents increases in the wake of the crisis, and branches' assets drop significantly as more funds are transferred to the parents. The model also predicts that the drop in profits at the conglomerate level is more severe for parent-subsidiary pairs than for parent-branch pairs, so if changes in the extensive margin take

place, they will be more pronounced at the subsidiary level than at the branch level. This is consistent with the empirical evidence, which shows that a larger percentage of subsidiaries of exposed European banks (17 percent) were shut compared to branches (8 percent). The empirical evidence reported in the next Sections shows how the channels described above played a role in the data.

2 Data

In April 2010, Greece's credit rating was cut to sub-investment bond grade status, effectively shutting Greece out of the bond market (Obstfeld (2013)). Eurozone countries, the ECB and the IMF responded by providing a bailout loan to rescue Greece in May 2010. Later that year, the European Union and the IMF provided funding to Ireland (November 2010) and Portugal (April 2011) after the credit rating of these countries also dropped markedly. Growing concerns over the domestic banking sector and the economic outlook led to a deterioration of the credit rating of Spanish and Italian government bonds.

In order to explore the predictions of our quantitative framework, we use quarterly balance sheet information from offices of foreign banking organizations in the United States ("Report of Condition and Income" - or Call Reports). For the purpose of our study we use information regarding the bank's entity type and consider bank subsidiaries in the U.S. that are commercial banks, state-chartered saving banks, federal savings banks, or cooperatives.

Foreign banking offices in the U.S. also report their parent company, hence we are able to identify the ultimate European parent bank that owns the subsidiary or branch in the U.S. Since we are interested the parent's bank exposure to the European Sovereign crisis, we match this information to reported sovereign debt holdings of European banks provided as part of the European Banking Authority's (EBA) Stress Test information. In particular, the data

for bank holdings of local government debt comes from the EBA 2011 Stress Tests and reports a bank's sovereign debt holdings at the end of 2010. We only consider information on sovereign debt holdings at the earliest available date (December 31, 2010). This way we mitigate the influence of changes in the sovereign debt holdings that occurred during the crisis, as mentioned above. We focus on total "Gross Direct Long Exposure (accounting value gross of specific provision)" irrespective of its maturity. For each European parent bank we compute the total amount of its exposure to sovereign debt from Greece, Italy, Ireland, Portugal and Spain (GIIPS) at the end of 2010. To gauge the importance of the parent bank's total exposure to the Euro crisis, we further collect information on the parent's total assets at the end of 2010 from SNL Financial. Overall, we are able to match exposure information on 21 European parent banks to 55 foreign banking entities (date: December 31, 2010) in the United States. These banks are located in France, Germany, Greece, Italy, Norway, Portugal, Spain and Sweden and their combined share of assets in the United States was 7.2% as of December 31, 2013. The exposure to GIIPS sovereign debt for the banks in our subsample ranges from 0% to about 14% of their total assets.

3 Empirical Evidence

We classify parent banks as exposed if their share of sovereign debt holdings in relation to assets is above the sample median. Hence, we split the banks in two equally sized groups. Since our observations are at the semi-annual level, we define a crisis dummy to take on the value of one including and after 2011, and zero otherwise. Moreover, to examine how the European Sovereign crisis changed foreign bank behavior in the U.S., we also restrict our attention to the 12 semesters spanning from June 2008 to December 2013. Although we have

branch and or subsidiary-level information for all branches and all subsidiaries of a parent bank, we aggregate this information at bank-affiliate type level. Hence, for each parent bank and semester, we have one observation for the aggregate value of all branches and another one for the aggregate value of all subsidiaries. We chose to aggregate this information at the bank-affiliate type level so that heterogeneity in the number of branches or subsidiaries across parent banks is not affecting our results. Using this sample at the bank-affiliate type e of parent bank b at semester t level, we then estimate the following regression model:

$$\begin{aligned}
y_{e,i,t} &= \alpha_b + \beta_1 \text{Crisis}_t & (1) \\
&+ \beta_2 \text{Sub}_e \times \text{Crisis}_t \\
&+ \beta_3 \text{Crisis}_t \times \text{Exp}_{e,b} \\
&+ \beta_4 \text{Sub}_e \times \text{Crisis}_t \times \text{Exp}_{e,b} \\
&+ \rho_1 \text{Sub}_e \\
&+ \rho_2 \text{Sub}_e \times \text{Crisis}_t + \varepsilon_{e,i,t}
\end{aligned}$$

where $y_{e,i,t}$ is either the (1) natural logarithm of total assets of entity e at time t , or (2) a dummy variable taking on the value of one if parent bank b has a claim on entity e 's assets in period t . Crisis_t is an indicator variable taking on the value of one for all years after 2011 (included), $\text{Exp}_{e,b}$ is a dummy variable taking on the value of one when entity e 's parent bank b 's exposure to GIIPS-debt is above the sample median, and Sub_e is a dummy variable taking on the value of one if entity e is a subsidiary, and zero otherwise. Note that we also include parent bank b fixed effects so our estimated coefficients represent changes within parent bank. Hence, the coefficient β_1 represents how the European sovereign crisis led to changes in the relative size of branches within non-exposed banks (the omitted category), whereas β_2 reflects the differential effect for subsidiaries

Table 1: Relationship between a bank's overall Exposure to GIIPS-Debt in 2010 and changes in the structure of banks and intrafirm flows.

	$\ln(\text{TotalAssets})$	$P(\text{transf} > 0)$
<i>Crisis</i>	0.157 (0.17)	0.396*** (0.109)
<i>Crisis</i> \times <i>Sub</i>	0.02 (0.199)	-0.652*** (0.072)
<i>Crisis</i> \times <i>Exposed</i>	-0.969*** (0.305)	1.151*** (0.234)
<i>Crisis</i> \times <i>Sub</i> \times <i>Exposed</i>	1.371*** (0.366)	-0.836*** (0.187)
<i>Sub</i>	-1.248*** (0.208)	0.431*** (0.148)
<i>Exposed</i> \times <i>Sub</i>	0.834 (0.513)	0.953*** (0.27)
Obs.	318	275

of non-exposed banks. β_3 then estimates the differential effect of the European Sovereign crisis on branches of exposed banks. Finally, β_4 represents changes at subsidiaries of exposed banks with respect to non-exposed banks. To account for differences between subsidiaries and branches of exposed and non-exposed banks we also include dummy variable to capture those (ρ_1 and ρ_2). Standard errors are robust and clustered at the parent-bank-level. We display the results in Table 1.

In column 1 we examine how the relative size of branches and subsidiaries within a parent bank changes, depending on the parents exposure to the European Sovereign debt crisis. Non-exposed banks are not changing their structure in the U.S. during the European Sovereign Crisis. Exposed banks, however, changed their presence in the U.S. As shown by the negative coefficient on $Crisis_t \times Exp_{e,b}$, branches of non-exposed banks become smaller during the Eurozone crisis. Compared to branches, however, subsidiaries of exposed banks exhibit a different behavior as indicated by the positive coefficient on β_4 . Although the total effect ($\beta_3 + \beta_4$) is positive (0.402), it is not significant and hence

our results indicate that exposed banks only reduce the size of their branches in the U.S. whereas subsidiaries do not experience a reduction in assets –in line with the model prediction about subsidiaries’ assets remaining unaffected by a shock to the parent.

In column 2 we analyze intra-firm flows between foreign banking offices and European parents during the EU Sovereign crisis. The values in column 2 represent average marginal effects on the probability of sending funds to the parent. Our findings indicate that, also in during the European Sovereign Crisis, branches were more likely to send funds to their parent via intra-firm flows. While we find that this effect holds for foreign bank offices of exposed and non-exposed banks alike, the magnitudes are very different. Compared to branches of non-exposed banks, branches of exposed banks are more than three times as likely ($=1.151 / 0.396$) to becoming net providers of intra-firm asset flows. More importantly, the probability that a subsidiary sends money to the parent increases by about 44% while the probability that a U.S. branch of an exposed parent sends money back to the European parent increases by more than twice that amount, also in line with the predictions of the model.

4 Conclusions

There is an active literature that studies the effects of the existence of global banks. Our work sheds some light on the effects of their organizational choices on the international transmission of shocks. We present a simple model that illustrates the mechanisms at work. Branches are more likely to decrease their lending activities in the host country suddenly after a shock in their home country and are also more likely to provide liquidity to the parent via intra-firm transfers. Subsidiaries are more resilient to shocks to the parent’s country since they have to be capitalized independently. The empirical analysis corrob-

orates these testable implications using data from European banks that were exposed to GIIPS sovereign debt and information on the U.S. affiliates of these exposed banks. While branches of foreign institutions are important players in the U.S. credit markets, they represent a potential source of financial instability given their sensitivity to exogenous foreign shocks. As such, current reforms that advocate the creation of well capitalized intermediate holding companies should address some of the concerns caused by the institutional characteristics of foreign-owned branches.

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