Global Banks and Syndicated Loan Spreads: Evidence from US Banks[1]

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Abstract

This paper explores the relationship between bank global exposure and their syndicated loan spreads. Linking syndicated loan information from Dealscan with confidential US bank foreign exposure data and borrower characteristics, we find that more bank global exposure is associated with a higher loan spread that is statistically significant. To analyze this relationship between global banks and loan spreads, we develop a theoretical framework where, in equilibrium, riskier borrowers are more likely to work with global banks. Using a Heckman selection model, we confirm that borrower risk characteristics indeed predict a higher likelihood of having a loan arranged by a global bank. However, after controlling for the bank-borrower selection effect, we continue to find that global banks charge on average an 12.7 bps higher spread on their syndicated loans, as compared with domestically focused banks. Finally, we explore a non-risk based alternative where firms with multinational operations are more likely to work with global banks for international banking services.

1 Introduction

Do global banks price loans differently than non-global banks? The answer to this question is essential for understanding the ever changing role of banks and evaluating the fundamental economic consequences of a globalizing financial sector. When banks operate in a perfectly competitive environment, borrower risk characteristics alone should inform loan pricing. However, when frictions exist, it is possible that banks lend to customers with spreads that reflect both borrower risk and bank characteristics. Yet, little is known about the effect of a lender's international exposure, as a bank characteristic, on loan terms to its customers.

In this paper, we examine how a bank's global exposure might affect cost of corporate funding through the spreads charged on syndicated loan. On one hand, if an extensive global bank network leads to larger loan capacity and lower bank funding costs, banks may can pass down these savings to their borrowers as lower loan rates or spreads. On the other hand, if global banks deliver premium international banking services and can better withstand a domestic funding cycles, then they may charge higher loan spread. While these channels, and potentially many more, are likely to be working simultaneously, we find that on net, more bank globalization tend to be associated with higher loan costs for firms.

We construct a new dataset that matches bank characteristics (Y9C) and borrower characteristics (Compustat), for syndicated loans led by US banks in DealScan. In a simple regression framework, we find evidence that loans organized by US banks with larger foreign exposure is correlated with higher spread, even after controlling for borrower riskiness, loan size, and other bank characteristics. This positive relationship between a bank's global exposure and loan pricing structure is true for spreads, fees, and all-in-spreads that include both. When we break down the purpose of the loans, we find that this relationship is largest in magnitude for term loans, but more statistically significant for lines of credit and real working capital loans. Further, we find that our results are stronger for the period prior to the global financial crisis (GFC)[1].

While our initial empirical results suggest that global banks are associated with higher loan spreads, this finding may be the result of an unobserved selection where global banks are more likely to work with riskier borrowers. However, unlike the usual self-selection endogeneity bias, banks cannot simply choose the riskiness of the clientele they want to lend. Instead, the bank-borrower relationship that links global banks with riskier borrowers must be an equilibrium outcome of both bank selection by borrowers and borrower selection by banks. To analyze how this bank-borrower selection can arise in equilibrium, we develop a model with asymmetric information where global and non-global banks face differential costs. Banks then design various loan contracts (loan spread and collateral) such that different borrower types choose the appropriate bank (global versus non-global) and contract that maximizes their expected utility. In equilibrium, we show that a larger fraction of bad type borrowers will work with global banks and that the average loan rate will be higher at the global bank to reflect the distribution of borrowers they face.

Given our theoretical predictions, we refine our empirical analysis by using a Heckman selection model where borrower risk characteristics are used in a first-stage Probit to identify the relationship between borrower type and their selection into global versus non-global banks. In the second stage, we run the pooled OLS regression specification with the inverse mills ratio from the Probit to control for this borrower-bank selection bias. We find that borrower characteristics of leverage ratio, size, and Altman Z score are all strongly predictive of working with a global bank. Moreover, the direction of association supports our hypothesis that firms with riskier characteristics (high leverage and low Altman Z score) have a significantly higher probability of having a loan arranged by a global bank. Despite these results, our second stage regressions show that this bank-borrower selection does not account for the higher premium on loan spreads from global banks.

Finally, we investigate the relationship between multinational borrowers and global banks, as a

[1] In a previous version, we also find that syndicated loans with a lead bank arranger with larger global exposure tend to include more foreign bank participation, which is associated with slightly lower spreads.

potential explanation for the positive relationship between bank foreign exposure and higher loan spreads. If global banks use their foreign operations to offer premium international financial services, firms with more multinational operations are more likely to pay higher loan spreads to access these services. Under this view, the premium can be interpreted as the equilibrium value of borrowers willingness-to-pay to work with a US global bank, as compared with other financial institutions.

To examine whether global banks offer specialized services to borrowers at a premium, we analyze the relationship between the foreign taxes paid by borrowers and the global banks. Including borrower foreign taxes as a measure of the borrower's global operations in the Heckman selection model, we find that indeed borrowers that pay higher foreign taxes are more likely to work with global banks. Then in the second stage regression, we find that the inclusion of borrower foreign tax increases the statistical significance of the coefficient on the inverse mills ratio, but still fails to explain the higher loans spreads from global banks[2].

Most academic research on global banks and bank international exposure has come on the heels of the recent global financial crisis. Papers in this line of research focus on shock transmission, where global operations of a bank can both serve to propagate shocks from abroad (contagion) and to alleviate the effects of domestic negative shocks (internal capital markets). Goldberg and Ceterelli (2014) show that global banks actively used their internal capital markets and tapped into these funding channels to offset liquidity shocks during the crisis. By contrast, Kalemli-Ozcan et al (2013) find that financial crises spread in a contagious way through banking linkages. Finally, Giannetti and Laeven (2012) find that global banks tend to pull back capital to their home country during a crisis. Not surprisingly, conclusions differ depending on whether the source of the negative shock is foreign or domestic. Beyond shock transmission, global banks play a role in altering the competition in foreign financial markets. Claessen, Demirguc-Kunt, and Huizinga (2001) finds that when foreign banks enter new markets, they

[2] Unlike the positive correlation between the riskiness of borrowers and loan spreads, there's no theoretical reason to assume that borrowers who are more global should have higher spreads. Therefore, unlike the upward selection bias with borrower riskiness, the same empirical effect should hold for borrower international operations.

earn profits at the expense of domestic banks in emerging countries, but not in developed markets. While the shock transmission and effects on the foreign economy are clearly interesting topics related to global banks, our paper does not directly address these issues. Perhaps closest to our paper is the line of research that examines the link between global banks and exports. Niepmann and Schmidt-Eisenlohr (2014) show that global banks play a large role in financing trade through the use of letters of credit. Similarly, Paravisini, Rapporport, and Schnabl (2014) find that banks specialize and develop comparative advantages in funding exports to different destination countries. Similar to these findings, our paper provides evidence that banking functions are specialized and that global banks provide value beyond simply a source of funding. Moreover, our paper quantifies this value as the borrower's willingness to accept higher loan spreads to access global banking services.

This paper is also distinct from the bank lending channel literature, where a fundamental identification problem exists because supply of funds from banks and the demand of funds by borrowers move together with the underlying state of the economy. Therefore, any identification of a supply side effect (or bank channel) on loan terms requires isolating demand factors. We argue that our variable of interest, bank foreign exposure, is less susceptible to this simultaneity issue. First, foreign operations of banks are generally associated with large fixed costs and therefore variations in global exposure cannot be easily reversed in response to business cycle fluctuations. This is certainly true for banking institutions that take in foreign deposits, but even for those banks that make loans globally, there are still fixed costs to operate and lend in foreign markets. Second, we focus on the loans of US global banks to US domestic borrowers. Foreign operations are likely to increase in response to increased foreign demand, which is not perfectly correlated with US borrower loan demand.

The paper is organized as follows. Section 2 provides an overview of the data and outlines our basic empirical specification. In addition, Section 2 summarizes the data and reports our empirical finding. Given our initial empirical findings, Section 3.1 outlines a bank selection relationship model, and derives an equilibrium relationship between global banks, borrower types, and loan spreads. Section 3.2 then provides empirical evidence in support of the theory by employing a Heckman selection model. Section 4 examines the international exposure of the borrower in connection with the prior empirical analysis. Section 5 concludes.

2 Empirical Analysis

This section provides some basic empirical evidence on the relationship between bank global exposure and the spreads on the syndicated loans that the banks arrange. We construct a new dataset that encompasses borrower financial information, bank balance sheet information, and loan terms. Below, we describe the construction of our dataset, summarize key features of the data, and characterize the relationship between bank foreign exposure and loan terms accepted by borrowers in a simple pooled regression framework.

2.1 Data Construction

We begin with the syndicated loan data from Dealscan as the base for our data construction. This data features deal level information such as spreads, fees, purposes, covenants, and the banks involved in the deal from 1985 - 2013. These syndicated loans can be lines of credit as well as term loans[3]. Therefore, the spread on a syndicated loan can be both actual borrowing costs for new funds, or potential borrowing costs to committed funds from the bank. In order to associate the transactional data from Dealscan with quarterly financial reports on banks and firms, we use reported bank and firm financial data as of the end of the quarter prior to the deal date.

First, we identify all deals in which a US bank organized or participated in a syndicated loan and hand-match every US bank by their name to their bank holding company (BHC)[4]. This match is done

[3] It is important to note here that syndicated loans can often be lines of credit rather than received funds. For instance, Apple has a $1.5 billion US dollar credit facility open, but has only draw down a small fraction of the line.

[4] We include subsidiaries of banks such as Bank of America Capital Markets, under Bank of America bank holding company. We do not include Investment Banks and other financial institutions that are not a part of a bank holding company.

at the bank year observation level because there are significant changes to the association of banks to bank holding companies over time, through mergers, spinoffs, and corporate re-organizations[5]. Because we have in-depth regulatory filings on US banks, our current study confines to only US banks, although there is a clear increase in the participation by foreign banks both as lead managers and participants over time. After matching banks in Dealscan to their bank holding companies that report a Y9C, we collect individual bank financial information from Y9C (bank total assets, total deposits, capitalization ratio).

Next, we eliminate all deals that where the lead bank was not a part of a US BHC. Following Ivanshina (2009), we define lead bank as administrative agent, if identified. If the syndicated deal does not have an administrative agent, we use book runner, lead arranger, lead bank, lead manager, agent, or arranger to identify lead banks. Moreover, following Ivanshina (2009), we eliminate any deal with more than two lead banks. In the cases where there are two lead banks, we average the financial variables across the two banks and identify the average as the lead bank statistics.

Finally, we collect borrower information from CRSP/Compustat using the data link provided by Michael Roberts through WRDS. Again, this restricts our sample to pubically-traded US borrowers. Using only Compustat firms also eliminates deals with non-listed firms. However, the benefit of focusing on public firms is being able to collect financial information before and after the loan is structured. Using Compustat data, we collect the following borrower information: long term debt, total assets, total liabilities, current assets, current liabilities, market value of equity, book value of equity, working capital, retained earnings, total sales, earnings before interest and tax (EBIT), foreign tax, net property plant and equipment (PPE), income before extraordinary items, depreciation and amortization.

[5] We were able to match over 85% of all US banks deals. Banks not included in the match often have less than 5 deals in Dealscan across all sample periods.

2.2 Data Overview

This section provides a brief summary of the data, broken down by deal, borrower, and bank statistics. Table 1 characterizes the average loan statistics, as well as the tenth percentile and ninetieth percentile. We compute these statistics for the full sample period of 1984 - 2013, for select individual years, and for years surrounding the global financial crisis (2007, 2008, 2009)[6].

First, we find a dramatic increase in the number of deals leading up to the global financial crisis, and a dramatic decline during the crisis. In 1990, there were 677 syndicated loans made to US borrowers and organized US banks. By 2000, this number had increased to 1,552 deals, a 229% increase. During the global financial crisis, we find the number of syndicated loan deals decreased from 1,067 in 2007 to a mere 448 in 2009. Since then, the number of loans has recovered somewhat to 741 and 776 in 2010 and 2013 respectively. Interestingly, while the number of deals has not returned to the levels in 2000, loan amounts exceed pre-crisis levels. Prior to the crisis in 2007, the average loan size in our sample is $648 million, which decreased to $447 million during 2008. Most recently, in 2013, the average loan amount of $900 million is notably higher than in 2007. This pattern not only holds for the average loan size statistic, but also for the 10th and 90th percentile.

Second, Table 1 shows the time variation in spreads and various fee types such as annual fees, upfront fees, commitment fees, and standby line of credit fees. For loan spreads, we find that the average spread over LIBOR over the entire sample period was 155.5 basis points (bps), with the lower spreads earlier in the sample period. During the global financial crisis, spreads jumped from 124.1 bps in 2007 to 323.2 bps in 2013. Loan spreads remained high throughout 2010 at an average of 271.1 bps, and came down to 185.0 bps in 2013. This trend is particularly apparent in the lowest 10 percentile of spreads, which increased four-fold during the financial crisis and in 2013 remains twice as high as 2007. We see a similar pattern across all fee types.

[6]For a complete analysis of how banks changed their loan pricing in response to the global financial crisis, see Santos (2009)

To understand the types of participants in the syndicated loan market, Table 2 reports financial information of lead US banks and US borrowers. We begin with a summary of the number of lead US banks who organized the loans described in Table 1. We find that overall the number of US banks that participate in the syndicated loan market has declined. This is due to the heavy consolidation of banks during the late 1990s and 2000s, detailed in Karolyi and Taboada (2015). For example, in 1990, 89 distinct lead US banks organized 677 deals. By 2007, as few as 41 US banks organized 1,067 deals, and more recently in 2013, only 27 US banks lead 776 deals.

For bank statistics, Table 2 shows that the average ratio of foreign CI (commercial and industrial) lending as a ratio of total CI lending, ForeignToTotCI, has increased slightly over time. However, for US banks in the tails of the distribution at the 10th and 90th percentile, foreign exposure experienced a larger increase over time. Interestingly, US banks involved in syndicated loans varied dramatically on their ratio of foreign to total CI lending during the financial crisis, going from 70.7% in 2007 to 30% in 2009. This is due to the fact that large global US banks pulled back their lending activities during the financial crisis. For other bank financial variables, we find that the sample of US banks that operate in the syndicated loan market appear to be shifting out of the commercial and industrial lending business, as evidenced by the decline in average total CI over assets, Lead TotCItoAssets, over time. Moreover, we find that bank capitalization ratio, equity to assets, and bank size (log asset), appears to increasing steadily over the sample period.

Finally, the last three variables of Table 2 describes the evolution of average borrower financial characteristics over time. Unlike bank characteristics, we find that borrower characteristics have largely stayed the same throughout the sample period, with a slight increase in firm size over time. For the two measures of borrower risk, firm leverage and Altman Z score, we find a slight decline in the average leverage ratio and Z score during the financial crisis. However, by 2010, both statistics mostly recovered to pre-crisis levels.

2.3 Pooled Regressions

Our empirical analysis begins with a basic pooled ordinary least squares (OLS) analysis of loan spreads on bank characteristics, while controlling for borrower risk characteristics. Given our loan-borrower level observations, we apply the following regression specification on a loan from bank, i, to borrower, j:

$$Spread_{i,j,t} = \alpha + \beta BankForeignExp_{i,t-1} + \Theta BankChar_{i,t-1} + \Omega BorrowerChar_{j,t-1} + u_{i,j,t} \quad (1)$$

where $Spread_{i,j,t}$ is the spread over LIBOR of the loan[7], and $BankForeignExp_{i,t-1}$ is the measure of bank foreign exposure. $BankChar_{i,t-1}$ and $BorrowerChar_{j,t-1}$ are the bank and borrower characteristics respectively in the quarter prior to the loan. For bank characteristics, $BankChar_{i,t-1}$, we use the following variables: Total CI lending to Total Assets, Equity to Asset ratio (Capitalization), and log Total Assets (size)[8]. For borrower characteristics, $BorrowerChar_{j,t-1}$, we compute the following variables: Leverage ratio = LT Debt / Total Assets, Cashflow ratio = (income before extraordinary items + depreciation and amortization)/net property plant and equipment, and Altman Z score = [(3.3*PreTax Income + Total Sales + 1.4*Retained Earnings + 1.2*(Current Assets - Current Liabilities)]/ Total Assets. Finally, we also include borrower industry fixed effects, year fixed effects, and cluster standard errors by bank.

For the purpose of our empirical analysis, we define bank foreign exposure, BankForeignExp, in two ways. First, for the asset side, we use foreign CI to total CI as a measure of a bank's international exposure. This is a more general exposure measure as foreign CI as cross-border loans do not necessitate the existence of a foreign office. By contrast, our second liability side global exposure measure is foreign

[7]In a previous version, we have also used All-In spreads, which include fees. Results are quantitatively similar, and available upon request.

[8]We have also included other characteristics such as liquid assets to total assets. However, these characteristics appear to be insignificant over the entire sample, and matter only during the recent financial crisis.

deposits to total deposits. The foreign deposit variable is defined by the amount of deposits taken by the foreign office. Therefore, foreign deposits is related to physical operations in another country, as well as subject to deposit and banking laws of the host country.[9]

The importance of global operations can affect bank operations on several dimensions. On one hand, banks can use international markets to diversify risk. Diversification benefits can be realized from either lending to a more diverse set of borrowers or capitalizing from a larger funding base. Global banks can pass on these funding benefits to borrowers in the form of lower loan spreads. Alternatively, global bank may bundle loans with premium international financial services to customers. Given the additional access to these services, global banks can charge higher loan spreads to the customers that require these services. While both channels are likely to affect global banks in their loan pricing, our hypothesis examines the net effect and provides a possible explanation for the dominant effect. Therefore, our basic hypothesis on the relationship between bank foreign exposure and loan spreads are as follows:

H0: In a competitive market, borrower risk characteristics alone price loan spreads and bank characteristics do not matter. Controlling for borrower risk and other bank characteristics, we expect ***NO*** association between foreign exposure of banks and loan spreads.

H1a: Global exposure allow banks to provide international banking services that require a premium and therefore can charge ***HIGHER*** spreads on loans, as compared with less global banks. Controlling for borrower risk and other bank characteristics, foreign exposure of banks is ***POSITIVELY*** associated with loan spreads.

H1b: Global exposure allow banks to realize diversification benefits, lower funding costs, therefore price their loans with ***LOWER*** spreads than less global banks. Controlling for borrower risk and other bank characteristics, foreign exposure of banks is ***NEGATIVELY*** associated with loan spreads.

Table 3 reports the results for the pooled OLS specification and hypothesis outlined above. For our

[9]Note that foreign lending of the bank is lagged one period to avoid simultaneity issues of the bank co-determining foreign lending and loan spreads.

variable of interest, foreign CI lending to total CI lending, we find a positive (28.004) and statistically significant (tstat = 4.87) slope coefficient. Therefore, a 10 percentage point change of foreign CI to total CI would imply a 2.8 basis point higher average spread. To put this in perspective, note that a one standard deviation in the ratio of Foreign CI to Total CI across banks is 20.65 percentage points, which translates to a 5.6 basis point increase. Table 3 also shows that among other bank characteristics, only size (log assets) has a negative (-1.978) and marginally significant (tstat = -1.65) relationship with loan spreads. Our findings suggest that our bank foreign exposure measure is not simply a proxy for bank size, and that size and global exposure play distinct roles in affecting loan spreads. Moreover, the opposite signs of the slope coefficients show that size and global exposure may be countervailing effects on loan spreads.

Not surprisingly, we also find that borrower characteristics have a large and significant effect on the price of loan spreads. For example, the slope coefficient on the borrower's leverage ratio across all loans is 152.168 basis points and highly statistically significant (tstat = 21.05). This implies that a 1% increase in the leverage ratio correlates with a 1.52 bps higher spreads. Moreover, the slope coefficient on the borrower characteristics intuitively follows the direction of higher risk and higher spreads. We confirm that higher loan spreads are associated with borrowers who are more leveraged, smaller in size, and have lower Altman Z scores.

One motivation for this paper is to better understand global banks and their loan pricing during non-crisis times. Therefore, Table 1 also reports the results of an identical pooled regressions applied on pre-crisis data, 1985 - 2007. Eliminating the disruptive effects from the global financial crisis, we find that the magnitude of the coefficients on All Loans, Credit Lines, and Real Loans are larger and have stronger statistical significance than the full sample estimates. While one may expect that bank characteristics matter only during crisis times, our results suggest that a bank's global exposure matters for loan pricing even during normal times.

While Table 3 uses the ratio of foreign CI lending to domestic CI lending as a measure of global exposure for the bank, foreign liabilities can also be an indication of a bank's global operations. Using foreign deposits to total deposits as an alternative measure of a bank's global exposure, 4 confirms the positive correlation between a bank's global exposure and the spreads charged on their syndicated loans. Using the ratio of foreign deposits to total deposits as a measure of a bank's global exposure, we find that the slope coefficient is 21.421 and highly statistically significant (tstat = 3.55) for all loans. This implies that a 1% increase in a bank's foreign deposit to total deposit yields a 0.214 basis point increase in loan spreads.

Interestingly, when we use liability side to measure global exposure, other bank characteristics also become statistically significant correlated with loan spreads. In particular, a higher total deposits to total liability ratio is associated with a higher spread on all loans, and significantly so (38.041, tstat = 3.31). This is perhaps a bit surprising as some studies have shown that higher ratio of core deposit funding on the bank's balance sheet leads to more lending volumes (e.g. Cornett et al (2011)). Alternatively, this result may be viewed in the context of the relationship lending literature. Although the banks in our sample are generally larger than is usually considered in the relationship lending literature (e.g. Berger and Udell (1995)), there may still be relative differences in how banks resolve information asymmetries with borrowers. If deposit-taking banks in our sample are more inclined to lend to borrowers with lesser quality information then this will be reflected in higher loan rates earlier in the relationship (see Petersen and Rajan (1995)). In addition, our result is similar to Berlin and Mester (1999), who also find a positive relationship between core deposits and loan spreads. Finally, Table 2 suggests that higher bank capitalization ratio, equity over assets, is associated with lower loan spreads for their customers.

Last, we explore a specification where we include both our asset side (foreign CI to total CI) global exposure measure and our liability side (foreign deposits to total deposits) global exposure measure in the pooled OLS specification. Table 5 confirms our previous findings with the slope coefficient on foreign CI to total CI loans again positive (55.522) and statistically significant (tstat = 4.99). By contrast, the slope coefficient on the foreign deposit to total deposit turns negative and statistically significant (-29.692, tstat = -2.56) when both measures of foreign exposure are included. Consistent with the view that internal capital markets allow global banks to diversify sources of funding, US banks with high fraction of foreign deposit offer lower loan spreads. This suggests that the relationship between bank foreign exposure and loans pricing differ depending on the type of global activities the bank chooses to pursue.

2.4 Additional Considerations

One potential concern with the above analysis is that we are not perfectly controlling for the riskiness of the syndicated loans. Therefore, the higher observed loans spreads organized by banks with higher global exposure simply reflect riskier borrowers (low credit rating) or riskier deals (larger loan amounts). This section evaluates these two alternatives by including credit ratings and loan amounts into the pooled OLS specification. First, we evaluate our prior analysis on a subsample of firms with credit rating information. The addition of credit rating reduces our sample of loans by almost 50%, with qualitatively similar results. Second, we include log loan amount as a control for deal size. This specification evaluates the possibility that banks can trade off loan rate and the loan amount in order to manage risk.

Table 6 shows that the inclusion of these two variables does not change our initial findings that bank global exposure increases loan spreads charged to their customers. When we evaluate only firms with credit ratings, we find that the slope coefficient on the bank's global exposure characteristic is attenuated from 28.004 to 12.54, but nevertheless statistically significant with tstat of 2.09. Not surprisingly, borrower credit rating has a large effect on loan spreads (21.112, tstat = 35.76), and reduces the importance of firm size, as credit rating and firm size are correlated. With the inclusion of credit ratings, we continue to find a positive and statistically significant slope coefficient on our foreign exposure measure, foreign C&I to total C&I, even though the sample size with credit ratings is only about half of the full sample of all borrowers. Table 3 also reports the results of the pooled OLS that includes log loan amount. We find that there is a negative association between loan amounts and loan spreads. Since loan amount and borrower size are strongly correlated, including loan amount attenuates the effect of borrower size and like borrower size, has a negative slope coefficient. Again, we find that the slope coefficient on our global exposure remains largely unaffected (26.008, tstat = 4.62) even when we control for loan size.

3 Bank-Borrower Selection

The above analysis shows that banks with more global exposure are associated with higher loan spreads. While there may be valid reasons for why loans from global banks command a premium, it may also be the case that riskier borrowers work with global banks. In the case where riskier firms systematically choose to work with global banks, the higher loan spread found above may be a product of selection bias.

At first glance, the above problem appears to be a standard self-selection problem. However, the relationship between a bank's global exposure and the loan spreads is the result of an endogenous matching problem involving both banks and borrowers rather than simply the result of selection decisions. If global banks' borrowers are riskier on average, but this risk is observable, then pricing differentials should vanish with the appropriate borrower level controls. If, on the other hand, a bank does not perfectly observe a borrower's riskiness then loan spreads would vary with a bank's unobservable inference of risk given borrower characteristics. That is, we argue that this matching problem gives rise to a non-zero correlation between borrower characteristics and the error term in equation 1, $BorrowerChar_{j,t}$ and $u_{i,j,t}$ respectively. Since our parameter of interest is the slope coefficient, β, on $BankForeignExp_{i,t-1}$, this correlation is not generally a concern if $BorrowerChar_{j,t}$ is unrelated to $BankForeignExp_{i,t-1}$. However, if riskier firms tend to work with global banks, then borrower characteristics will be related to bank foreign exposure, and our β estimate will be biased.

The following section develops a simple model to examine this relationship between riskier borrowers and global banks. We consider a model with two bank types and two borrower types. We assume that borrower type is not observed by banks and that global banks are less efficient than domestic banks in loan servicing. The model equilibrium features the selection of risky borrowers with global banks and, consequently, higher equilibrium loan prices for global banks driven endogenously by its pool of borrowers.

3.1 A Model of Bank Selection

This section outlines a model that generates, as an equilibrium outcome, the self-selection of riskier borrowers to more globally exposed banks. The basic intuition of our model goes as follows. For simplicity, we can think of there being two bank types, global and domestic, and two borrower types, high and low. Global and domestic banks differ in their production technologies. Both bank types compete for good and bad borrowers, characterized by their probability of achieving a high return. Because banks are unable to distinguish between borrower types, banks offer a menu of interest rates and collateral requirements to screen borrower types, in the spirit of Rothschild and Stiglitz (1976). Higher fixed costs for global banks along with a zero profit condition imply that global banks' all-in pricing to borrowers will be higher than that of domestic banks. On the other hand, their higher monitoring costs imply that they are less efficient at screening and will therefore have a comparative advantage in lending to bad borrowers. Consequently, their contracting terms to bad relative to good borrowers is better than that of domestic banks. Because global banks' contract terms give a relative preference to bad borrowers when contrasted with domestic banks, global banks will disproportionably attract bad borrowers.

Global banks are modeled as less efficient at monitoring than their domestic counterparts, in the sense of costly state verification in the spirit of Townsend (1979).[10] There are at least two of each bank type. Borrowers, indexed by $i \in \{H, L\}$, invest in projects that have return $R > 0$ with probability p_i and return 0 with probability $(1 - p_i)$. We assume that the high type borrower has higher p_i than the low type borrower, so that $p^H > p^L$. In addition, borrowers are endowed with a preference parameter $\eta \sim \Phi([\underline{\eta}, \bar{\eta}])$ that is realized in the borrower's utility should the borrower chooses a global bank.

Banks, indexed by $b \in \{G, D\}$, cannot observe the borrower's type.[11] To screen borrowers, banks offer loan contracts, (r_b^i, c_b^i), specifying an interest rate and amount of collateral to be posted. In the event that the bank seizes the collateral, the bank is only able to recover a fraction $m_b \in (0, 1)$ of the collateral. The quantity $(1 - m_b) * c_b$ can be interpreted a cost of liquidating collateral and $m_b * c_b$ as the recovery value. Assume $m_G < m_D$, so that global banks recover a lower fraction of the collateral in liquidation. Finally, global banks and domestic banks differ in their fixed costs, K_b. We assume that the fixed costs of being global are greater than that of being domestic, so that $K_G \geq K_D$.

The bank's profits can be written as:

$$\Pi_b = \max_{(r_b^i, c_b^i), i \in \{H,L\}} \mu_b \left[p^H r_b^H + (1 - p^H) m_b c_b^H) - K_b \right] \tag{2}$$

$$+(1 - \mu_b) \left[p^L r_b^L + (1 - p^L) m_b c_b^L) - K_b \right] \tag{3}$$

where μ_b is the proportion of H borrowers at bank type b.

Borrower i must choose both a bank and a contract within a bank. A borrower i's utility from a contract (r, c) from bank b is given by: $p^i(R - r) + (1 - p^i)(-c) + \eta \mathbf{1}_{\{b=G\}}$, where the last term reflects the borrowers utility from choosing a global bank. Borrower preferences for a global bank may include considerations such as a branch network or global banking services, discussed in the introduction. The incentive compatibility constraints dictate that a borrower of type i does not prefer the contract of the other type, for both bank types. This implies that for any bank type, b, we have the following

[10] Using only two borrower outcomes, this reduces trivially to monitoring conditional on the low state.

[11] Alternatively, the model can be thought of as being conditional upon any public signals of type.

incentive compatibility constraint for both borrower types $i \in \{H, L\}$[12]:

$$p^i(R - r_b^i) + (1 - p^i)(-c_b^i) \geq p^i(R - r_b^{-i}) + (1 - p^i)(-c_b^{-i}) \tag{4}$$

Given the borrower's selection equation across contracts within a bank, we next turn to the borrower's selection decision across bank types. First, assume that $\underline{\eta}$ is sufficiently small that a borrower with this realization of η will always prefer a D bank and $\bar{\eta}$ is sufficiently high that borrowers with this η realization will always prefer a G type bank. By continuity, this implies that there will exist some threshold value of η for each borrower type, (η_H^*, η_L^*), such that a borrower of type i is indifferent between banks at η_i^*. Moreover, borrower i chooses a G type bank if and only if $\eta_i > \eta_i^*$. The indifference condition at this threshold is written as:

$$p^i(R - r_G^i) + (1 - p^i)(-c_G^i) + \eta_i^* = p^i(R - r_D^i) + (1 - p^i)(-c_D^i) \tag{5}$$

Consequently, for any given thresholds (η_H^*, η_L^*) the proportion of high type borrowers μ_b facing each bank type b will be:

$$\mu_G^* = \frac{1 - \Phi(\eta_H^*)}{(1 - \Phi(\eta_H^*)) + (1 - \Phi(\eta_L^*))} \tag{6}$$

$$\mu_D^* = \frac{\Phi(\eta_H^*)}{\Phi(\eta_H^*) + \Phi(\eta_L^*)} \tag{7}$$

where the numerator is the mass of high type borrowers that choose bank b and the denominator is the total mass of borrowers that choose bank b.

Due to the competition within the group of global banks, G, and within the group of domestic

[12] Note that η does not appear in the IC constraint, as it affects the selection between global and domestic banks but not the selection of contracts within a bank type.

banks, D, banks in equilibrium will have a zero profit condition. In fact, the zero profit condition must hold for each bank-borrower combination (see Mas-Colell, Whinston & Green Lemma 13.D.3).[13]

The zero profit conditions for both borrower types for both bank types can be written as:

$$p^H r_b^H + (1 - p^H) m_b c_b^H = K_b \tag{8}$$

$$p^L r_b^L + (1 - p^L) m_b c_b^L = K_b \tag{9}$$

First, we show that for the low types, both global and domestic banks specify a contract with a zero collateral requirement. The reason for this is that since banks only recover a fraction, m_b, of the collateral in the liquidation, there is a dead-weight loss associated with using collateral as a contracting tool. Therefore, banks want to limit the use of collateral *only* as a device to screen bad borrowers from good. Moreover, banks set interest rates sufficiently high to cover the fixed costs. Proofs appear in the Appendix.

Claim 1 *The Global banks offer the low (L)type borrower a contract of* $(\frac{K_G}{p^L}, 0)$*, while the Domestic banks offer the low (L) type borrower a contract of* $(\frac{K_D}{p^L}, 0)$

Since the low borrower type is offered either $(\frac{K_G}{p^L}, 0)$ or $(\frac{K_D}{p^L}, 0)$, depending on bank type, the expected cost for the low type is higher at Global banks G than at Domestic banks D. This comes from the fact that fixed costs K_G is higher than K_B. From this result, we rewrite the incentive compatibility constraints (Inequalities 4) as:

[13]The reason for this is as follows. Suppose that a bank earns positive profits on one borrower type and negative profits on another borrower type. Then, the bank could deviate by increasing the fees or rates to the negative-profit borrower. Doing so makes this contract less attractive to all types. So, the positive-profit borrower type's incentives are unchanged. Meanwhile, the negative-profit borrower would leave for a competing bank. As the borrower yielded negative profits, this is a profitable deviation for the bank, a contradiction.

$$p^H(R - r_b^H) + (1-p^H)(-c_b^H) \geq p^H(R - \frac{K_b}{p_L}) \tag{10}$$

$$p^L(R - \frac{K_b}{p_L}) \geq p^L(R - r_b^H) + (1-p^L)(-c_b^H) \tag{11}$$

which simplifies to:

$$p^H r_b^H + (1-p^H)c_b^H \leq p^H \frac{K_b}{p_L} \tag{12}$$

$$K_b \leq p^L r_b^H + (1-p^L)c_b^H \tag{13}$$

From inequality 13 there is a lower bound on c_b^H. This is the minimum collateral required to prevent the L type borrower from deviating to the H type contract. However, because collateral impose a deadweight loss, banks will minimize the extent to which collateral is used so long as borrower incentives are met.

The contract for the H type borrower is then solved in two parts. First, it is argued that the expression 13 holds with equality. Then we combine the incentive compatible condition in the equality of expression 13 with the zero profit condition on the high type borrowers in equation 8. With these two equations, we have a system of two equations and two unknowns, with which we can solve for the contract of the high type.

Claim 2 *The contract offered to the H type borrower is*

$$(r_b^{H*}, c_b^{H*}) = \left(\frac{K_b\left[(1-p^L) - m_b(1-p^H)\right]}{p^H(1-p^L) - m_b p^L(1-p^H)}, \frac{K_b(p^H - p^L)}{p^H(1-p^L) - m_b p^L(1-p^H)} \right)$$

.

Finally, we examine the proportions of borrower types at each bank type. In order to show that proportionally more low type L borrowers go to global banks, it is sufficient to show that $\eta^{H*} > \eta^{L*}$, where η^{i*} is the threshold above which borrowers of type i prefer bank G and are defined in equations 6. From the bank selection equations of 5, we have the following equalities for the two borrower types:

$$\eta_H^* = (p^H r_G^H + (1-p^H)c_H^H) - (p^H r_D^H + (1-p^H)c_D^H) \tag{14}$$

$$\eta_L^* = p^L r_G^L - p^L r_D^L = K_G - K_D \tag{15}$$

where we have substituted in the the solution for the contract into the expression for η_i^* in Equation 5. Since $\eta_L^* = K_G - K_D$, to show that the proportion of L types is higher at G banks than D banks, it is sufficient that $\eta_H^* > K_G - K_D = \eta_L^*$.

Claim 3 *The relative proportion of L borrowers to G banks is higher than that for D banks,* $\mu_G^* < \mu_D^*$.

Together, our results demonstrate how differences in fixed costs and monitoring costs between global and domestic banks may affect loan terms. We showed that this will then affect the equilibrium distribution of borrowers facing each bank type. Therefore, the next sections use empirical analysis to account for the equilibrium selection decisions and loan bundle pricing considerations laid out above.

3.2 Heckman Selection Model

The model above outlined how information asymmetries between banks and borrowers can generate an equilibrium where global banks may face a set of borrowers that are risker than domestic banks. To address this endogenous selection of borrowers to bank type, we augment a Heckman two stage model to account for the effect of the equilibrium matching between banks and borrowers. In the first stage of the Heckman model, we model the probability of risky borrowers choosing to work with a global bank in a probit model. We define a global bank dummy to be any bank-quarter in the top 25% of foreign CI to total CI. Then, in the second stage, we include the inverse mills ratio from the first stage probit in the second stage regression of global bank exposure on spreads.

Table 7 begins with a simple pooled OLS regression with the Global Bank Dummy. Similar to Table 3, we find that the slope coefficient on Global Bank Dummy is positive and statistically significant. On average, banks with the highest 25% of foreign CI to total CI are associated with 11.535 basis points higher spreads on their syndicated loans than all other banks (tstat = 4.60). These higher spreads are realized across loan types, with 7.255 bps premium on credit lines (tstat = 3.79) and 24.007 bps premium on term loans (tstat = 4.23). These results in Table 7 show that the Global Bank Dummy generates quantitatively similar results to using foreign CI to total CI.

The last two columns of Table 7 reports the results of the Heckman selection model. The first-stage Probit regression shows that higher borrower leverage and lower borrower Altman Z-score increases the probability of a global bank leading the syndicated loan deal[14]. These results support our model prediction that riskier borrowers tend to work with global banks. In addition to borrower riskiness, we also find that firm size is positively associated with the probability of having a syndicated loan organized by a global bank, and highly statistically significant (tstat = 21.56). In contrast to leverage and Altman Z, firm size does not have an immediate relationship to borrower riskiness. In later analysis, we explore the link between multinational firms, which is associated with size, and global banking.

Finally, we evaluate the second stage regression of loan spreads on bank characteristics, borrower characteristics, and the inverse mills ratio (λ) from the first stage probit. First, we find that even after controlling for the selection of risky borrowers with global banks, global banks have on average a 12.716 bps (tstat = 2.77) higher loan spread than non-global banks. In addition, we continue to find that higher leverage and lower Altman Z scores are associated with statistically higher loan spreads. Interestingly, the coefficient on λ is positive but statistically insignificantly (tstat = 0.80). This suggests that while risky borrowers may select to borrow from global banks, this selection does not fully explain the higher observed loan spread of global banks.

[14] We choose the Altman Z-score to provide a continuous measure of borrower riskiness, as compared to discrete measures such as credit ratings.

4 Global Banking and Multinational Firms

This section examines the relationship between global banks and multinational firms. Recent papers by Niepmann and Schmidt-Eisenlohr (2014) and Paravisini, Rappoport, and Schnabl (2014) showed that global banks provide specialized financial services to export firms. Examples of these premium financial services that may rely heavily on the international exposure of global banks might be trade finance, foreign exchange, and local banking services. Anecdotal evidence suggests that global financial firms offer these premium services only to regular customers, which may be bundled with loans and lines of credit with them. Moreover, the firms that demand these banking services are likely to be large, multinational firms with significant foreign or international banking needs.

Using the foreign tax data item in Compustat for the borrower, and scaling by total sales, we proxy for the borrower's potential demand for multinational banking services[15]. To understand the relationship between borrower international sales and global bank exposure, we augment the pooled OLS and Heckman analysis of Table 7 with our foreign tax measure. Table 9 shows that multinational borrowers have a higher probability of working with a global bank on their syndicated loan deals, that is statistically significant. Moreover, we find that the inclusion of the borrower's foreign tax increases the magnitude and statistical significance on the inverse mills ratio in the second stage Heckman regression. Nevertheless, we cannot reject the hypothesis that the richer selection of multinational risky firms with global banks has no affect on observed loan spreads. However, we continue to find that global banks are associated with a 12.43 bp higher loan spread that is statistically significant (tstat = 2.45).

As another piece of empirical evidence on the relationship between borrower characteristics and bank global exposure on loan spreads, we augment our pooled OLS specification in Table 3 to include interaction terms, with and without foreign taxes. The interaction term captures the joint effect on global bank exposure and borrower characteristics. As a benchmark, we evaluate the pooled OLS with

[15] We have also used foreign pre-tax income over total pre-tax income as an alternative proxy. The results are qualitative similar. However, given the large number of missing observations for foreign pre-tax income, we lose statistical significance due to low power.

interaction terms, but without the foreign sales tax of the borrower. Table 8 shows that including the interaction terms between global bank exposure and borrower characteristics lowers the magnitude and statistical significance of the slope coefficient on the bank foreign exposure variable, ForeignToTotalCI. This implies that global bank exposure alone does not necessarily imply higher loan spreads. Rather, when global banks work with specific types of borrowers, loan spreads tend to be larger. For the interaction terms, we find that when banks with high global exposure lend to firms that are less likely to default (high Z score), loan spreads tend to be lower (-16.919, tstat =-2.77) than from banks with more domestically oriented US banks. Similar results hold for the slope coefficient (-2.761, tstat = -1.69) on the interaction term between global bank exposure and high cashflow ratio. This suggests that US global banks price discriminate and offer better loan terms than US banks with less global exposure. Interestingly, we find that the cross term between global bank exposure and borrower size is positive (5.137) and statistically significant (tstat = 2.20). This suggests that when global banks lend to larger size firms, the borrower is charged a higher rate than from a less global US bank. This evidence supports the above argument that global banks provide specialized banking services that is positively valued by large multinational borrowers.

Next, we repeat the pooled OLS analysis with interaction terms and include the borrower's foreign sales to total sales variable to proxy for multinational sales firms. First, the slope coefficient on the foreign tax to total sales (-396.954, tstat = -3.00) suggest that more multinational borrowers tend to have lower loan rates. However, the slope coefficient on the interaction term between global banks and the foreign sales tax of the borrower shows a positive relationship with loan spreads. The positive coefficient on CrossCIForeignTax loosely supports the argument that loans with global banks and multinational firms are priced higher to include premium banking services. However, we find that this relationship is only statistically significant for Term Loans which has the smallest sample size.

5 Conclusion

This paper examines the relationship between a bank's global exposure and the loan terms realized by their corporate borrowers. After adjusting for borrower risk characteristics, we find that on average spreads tend to be higher for banks with more global exposure, and statistically significantly so across loan types. This result is stronger for the sample period prior to the global financial crisis of 2008, and remains even after controlling for loan amount or for credit ratings for those borrowers that are rated.

Motivated by results, we investigate an alternative hypothesis that higher spreads from global banks are driven by an endogeneity in which they face a riskier pool of borrowers. Such a problem would imply that the bank itself does not observe the riskiness of borrowers, and equilibrium loan rates from global banks are higher due to this asymmetric information.[16] To examine the equilibrium relationship between global banks, borrower type, and loan spreads, we model banks as offering different contracts, spreads and collateral, to screen borrowers and resolve the information asymmetry problem. Differentiated by their cost structures, global and non-global banks offer contracts such that a larger proportion of risky borrowers will borrow from global banks. In equilibrium, loan rates from global banks will then be higher than loan rates from non-global banks.

We empirically evaluate our theoretical finding that riskier borrowers are more likely to choose global banks, and drive up loan rates, by using a variation of the Heckman selection model. Rather than self-selection by the bank, we use borrower risk characteristics in the first stage selection equation. We find strong evidence that riskier borrowers have a higher probability of working with global banks. However, using the inverse mills ratio in the second valuation equation, we do not find a significant affect of this selection on the higher loan spread found previously.

Alternative to a risk based explanation to the higher spread charged by global banks, we examine the hypothesis that global banks provide premium banking services such as trade financing, foreign

[16] This is in contrast to the case where the information asymmetry lies only between the econometrician and the bank. In that case the problem would be resolved if the econometrician could condition on the bank's variables.

exchange, and cross-border lending. If global banks offer these services only to customers that also hold lines of credit or debt facilities with the bank, then spreads may be higher as an access fee for these premium services. We conjecture that these international financing services are most needed by firms with high foreign sales. Using data on the borrowers foreign tax paid, scaled by total tax, we find evidence that borrowers with higher foreign taxes prefer to work with global banks, but that this selection does not explain the global bank premium.

In this paper, we examined the role that global operation play in financing to customers. However, valuing the social costs and benefits of global banks must account for all stakeholders. For example, how do global banks affect firm productivity (TFP) and shareholder value (Tobin's Q), or other measures of firm productivity post loans. In addition, we want to more closely examine the set of firms that do multiple syndicated loans and use the switch between banks with more or less global exposure.

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Table 1: Syndicated Loan Statistics

Deal term summary statistics pooled and across selected years. Variables reported in means and the 10th and 90th percentiles.

		1984 - 2013	**1987**	**1990**	**2000**	**2010**	**2013**	**2007**	**2008**	**2009**
Number of Deals		28,591	303	677	1,552	741	776	1,067	638	448
Spread (BaseRate = LIBOR)		155.5	110.2	118.8	156.8	271.1	185.0	124.1	195.0	323.2
	p10	27.5	37.5	27.5	22.5	150.0	100.0	20.0	50.0	200.0
	p90	300.0	225.0	250.0	312.5	425.0	300.0	250.0	375.0	450.0
shareForeignBank		18.0%	8.8%	12.1%	18.1%	23.9%	24.6%	20.5%	17.3%	18.3%
	p10	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	p90	50.0%	40.0%	50.0%	50.0%	52.5%	50.0%	50.0%	50.0%	50.0%
AnnualFee (bps)		30	33	30	27	53	35	16	33	65
	p10	8	1	4	10	25	20	6	8	15
	p90	57	92	50	50	75	50	26	75	131
UpfrontFee (bps)		96	161	115	73	119	63	80	170	190
	p10	13	25	15	15	30	0	5	11	23
	p90	200	345	260	200	200	200	150	300	300
CommitmentFee (bps)		62	77	70	70	70	52	42	51	77
	p10	25	38	25	25	30	12	15	19	38
	p90	100	100	100	100	113	100	75	75	113
StandbyLCFee (bps)		275	239	252	347	426	363	182	265	464
	p10	83	120	100	120	250	225	53	90	255
	p90	500	350	400	600	638	550	338	431	644
LoanToAssets		18.4%	20.4%	18.1%	16.9%	16.6%	15.3%	18.6%	18.0%	14.4%
	p10	2.6%	1.5%	2.8%	2.3%	3.0%	2.0%	2.9%	2.2%	1.8%
	p90	38.4%	43.8%	39.2%	37.7%	36.6%	33.3%	38.1%	38.1%	34.3%
LoanAmt (in Mil$)		346	126	114	290	568	900	648	447	542
	p10	8	4	3	10	30	75	40	25	25
	p90	835	250	300	700	1300	2000	1500	1000	1000

Table 2: Firm and Lead Bank Statistics

Firm and lead bank summary statistics pooled and across selected years. Variables reported in means and the 10th and 90th percentiles. When there is more than one lead bank, the lead bank variables are averaged. Bank variables are taken from Y-9C reports. Firm variables are taken from Compustat. Lead ForeignToTotCI is foreign CI lending as a proportion of total CI lending. TotCItoAssets is total CI lending as a proporiton of assets. Firm Size is measured in log terms.

		1984 - 2013	**1987**	**1990**	**2000**	**2010**	**2013**	**2007**	**2008**	**2009**
Number of Deals		28,591	303	677	1,552	741	776	1,067	638	448
Number of Lead Banks		344	57	89	81	34	27	41	34	37
Lead ForeignToTotCI		22.4%	21.8%	21.1%	21.9%	20.8%	29.0%	25.1%	22.0%	22.0%
	p10	0.6%	0.6%	0.1%	0.8%	2.2%	3.9%	2.3%	2.1%	2.4%
	p90	49.3%	48.6%	56.2%	43.9%	22.9%	75.7%	70.7%	49.0%	30.0%
Lead TotCItoAssets		16.3%	25.3%	23.0%	19.4%	8.0%	8.6%	9.9%	12.0%	10.2%
	p10	7.1%	19.2%	17.2%	13.5%	4.6%	5.3%	7.6%	8.5%	6.0%
	p90	26.1%	37.6%	30.1%	26.0%	13.5%	11.0%	13.3%	16.3%	15.7%
Lead Cap Ratio		7.8%	4.9%	5.5%	7.2%	9.3%	10.1%	8.4%	8.3%	9.3%
	p10	5.8%	3.6%	4.5%	6.1%	7.7%	8.4%	6.0%	6.5%	7.6%
	p90	9.9%	6.2%	6.5%	8.4%	10.6%	11.3%	9.8%	9.8%	11.4%
Lead Log Assets		19.36	17.54	17.72	19.44	21.03	21.26	20.74	20.68	20.89
	p10	17.32	16.51	16.32	18.12	19.38	21.08	19.04	18.80	19.13
	p90	21.39	18.43	19.24	20.34	21.58	21.62	21.43	21.47	21.54
Firm Leverage		30.1%	31.0%	30.2%	30.7%	29.1%	32.9%	30.5%	27.7%	28.5%
	p10	2.9%	2.9%	2.3%	3.5%	1.1%	11.5%	2.9%	0.3%	1.3%
	p90	55.6%	61.3%	55.0%	58.1%	55.2%	55.6%	56.8%	54.6%	59.8%
Firms Size		6.8	5.6	5.4	7.0	7.7	8.3	7.8	7.3	7.6
	p10	4.2	3.5	3.3	4.5	5.5	6.4	5.6	5.1	5.2
	p90	9.5	7.7	7.9	9.6	10.0	10.7	10.1	9.9	10.3
Firm Altman Z		1.5	1.8	1.8	1.4	1.5	1.6	1.6	1.4	1.3
	p10	0.2	0.5	0.3	-0.1	0.1	0.3	0.2	-0.3	0.1
	p90	3.2	3.1	3.2	3.2	3.1	3.0	3.2	3.3	2.9

Table 3: Loan Spreads: Foreign Lending as Global Exposure

OLS Regression results of base rate over LIBOR spreads on bank and firm characteristics. The first five columns are results from the entire sample period. The last five columns are pre-2008 only. In both sample periods, the first columns report the pooled sample. The second columns reports the subsample of Term Loans only. This is contrasted to the third columns that report the results from Credit Lines only. The fourth columns reports the results from Real Loans only. The fourth columns are contrasted with the fifth columns that report the results from Restructuring Loans only. In this table, global operations are measured with regard to foreign loans, captured in the ForeignToTotCI variable. t-Statistics are reported below the estimated coefficients. Significance at the 5% level are highlighted in bold.

Base Rate = LIBOR	**Full Sample (1985 - 2013)**					**Pre 2008**				
	All Loans	**Term Loans**	**Credit Lines**	**Real Loans**	**Restruct Loans**	**All Loans**	**Term Loans**	**Credit Lines**	**Real Loans**	**Restruct Loans**
ForeignToTotalCI	28.004	42.013	22.564	40.672	-8.387	30.879	41.741	27.475	47.681	-9.808
	4.87	**2.95**	**5.16**	**4.89**	-0.36	**5.12**	**2.87**	**5.81**	**4.97**	-0.40
TotCItoAssets	17.123	-10.648	31.852	20.555	-16.339	12.811	-20.736	33.516	4.107	-6.313
	1.04	-0.27	**2.23**	0.91	-0.26	0.78	-0.54	**2.32**	0.19	-0.10
Cap Ratio	-92.154	38.076	-104.002	-56.680	-611.570	-16.245	25.678	-46.196	123.051	-775.021
	-1.01	0.17	-1.48	-0.45	-1.79	-0.16	0.10	-0.58	0.80	-1.95
Log Assets	-1.978	-5.678	-1.798	-1.552	-3.547	-2.597	-7.706	-2.538	-2.490	-4.751
	-1.65	**-1.99**	-1.69	-1.04	-0.75	**-2.01**	**-2.50**	**-2.16**	-1.45	-0.92
Firm Leverage	152.168	94.944	127.012	159.054	72.599	142.193	92.876	118.811	151.580	67.729
	21.05	**9.34**	**19.49**	**15.45**	**3.74**	**20.66**	**8.95**	**18.98**	**14.24**	**3.42**
Firm Cashflow	0.026	-0.529	0.045	0.003	-4.342	0.082	-0.403	0.083	0.049	-4.038
	0.35	-0.84	0.76	0.04	**-2.06**	1.55	-0.66	1.70	1.23	-1.22
Firms Size	-26.530	-13.751	-27.392	-23.968	-21.875	-28.059	-13.423	-28.983	-25.248	-22.202
	-43.65	**-8.55**	**-57.11**	**-29.99**	**-6.85**	**-43.07**	**-7.86**	**-56.96**	**-27.89**	**-6.48**
Firm Altman Z	-13.135	-17.780	-10.174	-9.304	-22.833	-13.548	-14.158	-11.384	-8.535	-21.395
	-6.30	**-5.23**	**-5.72**	**-4.24**	**-4.97**	**-6.19**	**-4.13**	**-6.12**	**-3.34**	**-4.42**
Constant	248.0	331.2	240.0	197.7	400.6	269.225	362.070	265.134	212.449	429.183
	7.28	5.18	8.36	4.37	3.95	7.63	5.32	8.83	4.50	3.86
Adj R-sq	0.42	0.29	0.48	0.43	0.30	0.39	0.23	0.43	0.37	0.27
Obs	20004	4093	15003	10894	1270	16255	3228	12268	7835	1111

Table 4: Loan Spreads: Foreign Deposit as Global Exposure

OLS Regression results of base rate over LIBOR spreads on bank and firm characteristics. The first five columns are results from the entire sample period. The last five columns are pre-2008 only. In both sample periods, the first columns report the pooled sample. The second columns reports the subsample of Term Loans only. This is contrasted to the third columns that report the results from Credit Lines only. The fourth columns reports the results from Real Loans only. The fourth columns are contrasted with the fifth columns that report the results from Restructuring Loans only. In this table, global operations are measured with regard to foreign deposits, captured in the ForeignToTotDep variable. t-Statistics are reported below the estimated coefficients. Significance at the 5% level are highlighted in bold.

Base Rate = LIBOR	**Full Sample (1985 - 2013)**					**Pre 2008**				
	All Loans	**Term Loans**	**Credit Lines**	**Real Loans**	**Restruct Loans**	**All Loans**	**Term Loans**	**Credit Lines**	**Real Loans**	**Restruct Loans**
ForeignToTotDep	21.421	45.151	16.839	38.954	-17.844	28.416	46.928	24.176	46.304	-9.613
	3.55	**3.11**	**3.71**	**4.36**	-0.77	**4.58**	**3.21**	**5.03**	**4.73**	-0.40
TotDepToLiab	38.041	15.604	35.344	35.727	-8.357	69.817	37.763	58.879	68.818	25.107
	3.31	0.54	**3.80**	**2.35**	-0.16	**5.40**	1.19	**5.57**	**3.69**	0.42
Cap Ratio	-196.797	57.272	-193.362	-96.733	-658.885	-245.035	-75.614	-224.683	-79.570	-877.560
	-2.00	0.23	**-2.46**	-0.73	-1.77	**-2.19**	-0.28	**-2.51**	-0.50	**-2.01**
Log Assets	1.074	-2.984	0.415	1.545	-3.757	1.771	-4.112	0.650	2.581	-3.758
	0.88	-1.04	0.40	0.97	-0.75	1.40	-1.32	0.58	1.56	-0.70
Firm Leverage	152.370	94.450	127.129	159.342	72.712	141.837	92.168	118.432	151.292	67.675
	21.04	**9.33**	**19.44**	**15.45**	**3.75**	**20.67**	**8.91**	**18.92**	**14.23**	**3.42**
Firm Cashflow	0.022	-0.530	0.042	-0.003	-4.364	0.076	-0.404	0.078	0.042	-4.061
	0.31	-0.85	0.72	-0.04	**-2.06**	1.49	-0.67	1.67	1.14	-1.22
Firms Size	-26.253	-13.956	-27.133	-23.850	-21.578	-27.791	-13.666	-28.731	-25.037	-22.000
	-43.01	**-8.69**	**-56.27**	**-29.74**	**-6.76**	**-42.53**	**-8.01**	**-56.03**	**-27.59**	**-6.42**
Firm Altman Z	-13.217	-17.787	-10.254	-9.359	-22.905	-13.661	-14.140	-11.517	-8.666	-21.358
	-6.32	**-5.25**	**-5.74**	**-4.25**	**-5.01**	**-6.23**	**-4.14**	**-6.18**	**-3.39**	**-4.42**
Constant	178.72	265.61	190.62	126.47	409.62	159.04	266.77	187.19	88.80	397.41
	4.91	3.68	6.46	2.53	3.50	4.26	3.46	6.15	1.74	3.11
Adj R-sq	0.42	0.29	0.48	0.43	0.30	0.39	0.23	0.43	0.37	0.27
Obs	20004	4093	15003	10894	1270	16255	3228	12268	7835	1111

Table 5: Loan Spreads: Foreign Lending and Deposit as Global Exposure

OLS Regression results of base rate over LIBOR spreads on bank and firm characteristics. The first five columns are results from the entire sample period. The last five columns are pre-2008 only. In both sample periods, the first columns report the pooled sample. The second columns reports the subsample of Term Loans only. This is contrasted to the third columns that report the results from Credit Lines only. The fourth columns reports the results from Real Loans only. The fourth columns are contrasted with the fifth columns that report the results from Restructuring Loans only. In this table, global operations are measured with regard to both foreign loans and foreign deposits, captured in the ForeignToTotCI and ForeignToTotDep variables, respectively. t-Statistics are reported below the estimated coefficients. Significance at the 5% level are highlighted in bold.

Base Rate = LIBOR	**Full Sample (1985 - 2013)**					**Pre 2008**				
	All Loans	**Term Loans**	**Credit Lines**	**Real Loans**	**Restruct Loans**	**All Loans**	**Term Loans**	**Credit Lines**	**Real Loans**	**Restruct Loans**
ForeignToTotalCI	55.522	10.761	47.640	44.538	28.773	38.177	-16.557	42.205	44.279	-1.446
	4.99	0.38	**5.36**	**3.35**	0.64	**2.92**	-0.51	**3.92**	**2.74**	-0.03
TotCItoAssets	2.338	-7.607	18.128	9.826	-19.894	-1.757	-16.987	20.227	-7.127	-9.068
	0.14	-0.19	1.26	0.44	-0.31	-0.11	-0.44	1.39	-0.34	-0.14
ForeignToTotDep	-29.692	35.402	-27.129	-1.573	-42.149	-7.191	62.561	-15.491	5.377	-8.220
	-2.56	1.21	**-2.97**	-0.11	-0.93	-0.53	1.92	-1.42	0.33	-0.16
TotDepToLiab	29.071	15.379	25.053	32.557	-11.753	54.982	45.679	39.210	51.260	25.992
	2.49	0.53	**2.69**	**2.14**	-0.22	**3.98**	1.35	**3.55**	**2.75**	0.41
Cap Ratio	-234.968	52.855	-230.858	-152.877	-642.211	-220.837	-79.923	-206.861	-48.101	-873.347
	-2.38	0.21	**-2.90**	-1.14	-1.72	**-1.97**	-0.29	**-2.31**	-0.30	**-1.98**
Log Assets	-1.701	-3.681	-1.647	-0.226	-5.623	-0.530	-3.505	-1.455	-0.244	-3.804
	-1.23	-1.10	-1.36	-0.13	-1.00	-0.35	-0.98	-1.06	-0.12	-0.61
Firm Leverage	152.668	94.544	127.424	159.465	72.751	142.449	91.923	119.141	151.834	67.635
	21.11	**9.32**	**19.52**	**15.48**	**3.73**	**20.70**	**8.91**	**18.98**	**14.26**	**3.41**
Firm Cashflow	0.021	-0.533	0.041	-0.002	-4.416	0.075	-0.416	0.078	0.042	-4.052
	0.29	-0.85	0.70	-0.04	**-2.07**	1.45	-0.69	1.64	1.12	-1.22
Firms Size	-26.254	-13.950	-27.148	-23.864	-21.596	-27.785	-13.729	-28.723	-25.047	-22.026
	-43.00	**-8.69**	**-56.28**	**-29.73**	**-6.74**	**-42.48**	**-8.03**	**-56.06**	**-27.55**	**-6.39**
Firm Altman Z	-13.160	-17.778	-10.201	-9.308	-22.804	-13.600	-14.204	-11.427	-8.593	-21.369
	-6.30	**-5.25**	**-5.73**	**-4.23**	**-4.96**	**-6.20**	**-4.18**	**-6.14**	**-3.36**	**-4.41**
Constant	233.293	280.603	229.651	158.089	451.059	207.619	254.663	229.893	147.715	400.792
	5.94	3.37	7.11	3.02	3.44	4.95	2.87	6.60	2.62	2.67
Adj R-sq	0.42	0.29	0.48	0.43	0.30	0.39	0.23	0.43	0.37	0.26
Obs	20004	4093	15003	10894	1270	16255	3228	12268	7835	1111

Table 6: Loan Spreads: Global Exposure, Credit Ratings, and Loan Amounts

OLS Regression results of base rate over LIBOR spreads on bank and firm characteristics. The regression mimic those reported in Table 3, though credit ratings and log loan amount are added as explanatory variables. The first five columns are results from the entire sample period. The last five columns are pre-2008 only. In both sample periods, the first columns report the pooled sample. The second columns reports the subsample of Term Loans only. This is contrasted to the third columns that report the results from Credit Lines only. The fourth columns reports the results from Real Loans only. The fourth columns are contrasted with the fifth columns that report the results from Restructuring Loans only. In this table, global operations are measured with regard to foreign loans, captured in the ForeignToTotCI variable. t-Statistics are reported below the estimated coefficients. Significance at the 5% level are highlighted in bold.

Base Rate = LIBOR	**Full Sample (1985 - 2013)**					**Full Sample (1985 - 2013)**				
	All Loans	**Term Loans**	**Credit Lines**	**Real Loans**	**Restruct Loans**	**All Loans**	**Term Loans**	**Credit Lines**	**Real Loans**	**Restruct Loans**
ForeignToTotalCI	12.549	19.037	8.779	16.818	-7.513	26.008	41.589	20.935	40.398	-6.415
	2.09	1.12	**2.14**	**2.05**	-0.20	**4.62**	**2.94**	**4.88**	**4.96**	-0.28
TotCItoAssets	14.129	-3.909	20.469	-7.529	2.206	22.527	-9.412	35.669	27.609	-13.011
	0.58	-0.05	1.05	-0.26	0.02	1.38	-0.24	**2.52**	1.25	-0.21
Cap Ratio	13.909	371.177	-70.211	37.275	-11.952	-135.234	32.436	-144.087	-104.404	-579.461
	0.13	1.25	-0.92	0.25	-0.02	-1.51	0.14	**-2.08**	-0.85	-1.73
Log Assets	-0.572	-4.718	-1.165	0.952	-0.197	-0.739	-5.392	-0.872	-0.198	-2.844
	-0.31	-0.81	-0.85	0.46	-0.02	-0.62	-1.88	-0.83	-0.13	-0.61
Firm Leverage	67.944	38.595	55.368	63.140	58.009	157.429	97.256	131.037	164.073	76.273
	8.31	**2.87**	**7.73**	**5.29**	**2.12**	**22.05**	**9.05**	**20.50**	**16.26**	**3.99**
Firm Cashflow	-1.826	-6.222	-0.858	-0.757	-11.892	-0.002	-0.519	0.021	-0.037	-4.789
	-1.51	**-2.10**	-1.06	-0.62	**-2.30**	-0.03	-0.83	0.39	-0.62	**-2.38**
Firms Size	0.109	6.146	-3.050	2.136	2.601	-16.906	-12.181	-18.371	-13.266	-13.230
	0.09	**1.97**	**-3.43**	1.36	0.40	**-19.18**	**-5.27**	**-24.63**	**-12.09**	**-3.04**
Firm Altman Z	-8.595	-13.156	-6.605	-7.575	0.952	-12.427	-17.725	-9.548	-8.572	-21.449
	-4.57	**-3.24**	**-4.09**	**-3.17**	0.09	**-6.17**	**-5.22**	**-5.59**	**-4.08**	**-4.67**
Firm Credit Rating	21.112	24.174	17.690	21.693	18.632					
	35.76	**13.74**	**36.50**	**27.19**	**6.23**					
Log Loan Amt						-14.102	-2.166	-13.528	-16.429	-12.535
						-16.27	-1.08	**-16.18**	**-15.12**	**-3.14**
Constant	-121.117	-176.092	-57.546	-203.011	-66.312	235.427	324.510	235.828	186.583	370.055
	-2.53	-1.40	-1.53	-3.68	-0.27	6.80	5.04	7.96	4.29	3.65
Adj R-sq	0.63	0.46	0.68	0.65	0.49	0.43	0.29	0.49	0.44	0.31
Obs	10746	2127	8074	5897	517	20004	4093	15003	10894	1270

Table 7: Global Bank Dummy and Heckman Selection

OLS Regression results of base rate over LIBOR spreads on bank and firm characteristics using a Global Bank Dummy and results of a Heckman Selection model used to address firm selecting to borrow from global banks. Global banks are defined as those in the top 25% of foreign CI to total CI. The first columns reports the pooled sample. The second column reports the subsample of Term Loans only. The third column reports the results from Credit Lines only. The fourth column reports the results from Real Loans only. The fifth column reports results from a first-stage Probit regression of firm characteristics on the bank global dummy. The sixth column reports the second stage results of the Heckman Selection model, with Lambda being the coefficient on the Inverse Mills Ratio. t-Statistics are reported below the estimated coefficients. Significance at the 5% level are highlighted in bold.

Base Rate = LIBOR	**Pooled Regression**				**Probit**	**Heckit**
	All Loans	**Term Loans**	**Credit Lines**	**Real Loans**	**Bank Global Dummy**	**Rate over Libor**
BankGlobalDummy	11.535	24.007	7.255	16.915		12.716
	4.60	**4.23**	**3.79**	**4.80**		**2.77**
TotCItoAssets	32.305	15.886	42.600	41.395		30.714
	1.93	0.41	**2.94**	1.80		0.72
Cap Ratio	-62.523	168.102	-100.329	-49.745		-162.193
	-0.67	0.73	-1.38	-0.40		-1.13
Log Assets	0.048	-2.959	-0.036	1.322		1.462
	0.04	-1.12	-0.04	0.96		0.96
Firm Leverage	152.037	94.420	126.866	159.142	0.467	137.213
	21.04	**9.28**	**19.47**	**15.48**	**5.33**	**3.42**
Firm Cashflow	0.027	-0.489	0.047	0.004		-0.944
	0.38	-0.78	0.79	0.06		-1.02
Firms Size	-26.291	-13.738	-27.079	-23.644	0.327	-20.159
	-44.33	**-8.57**	**-58.22**	**-30.49**	**21.56**	-1.47
Firm Altman Z	-13.146	-17.840	-10.192	-9.331	-0.035	-13.454
	-6.32	**-5.29**	**-5.73**	**-4.27**	**-3.89**	**-4.39**
Lambda						44.193
						0.80
Constant	211.422	274.044	209.595	151.148	-3.334	253.528
	6.26	4.40	7.41	3.30	-13.86	1.24
Adj. R-sq	0.42	0.29	0.48	0.43		
Obs	20004	4093	15003	10894		
Avg yearly R-sq					0.16	0.35
Avg yearly Obs					1043	804

Table 8: Loan Spreads: Cross Effects and Multinational Firms

OLS Regression results of base rate over LIBOR spreads on bank and firm characteristics, including interaction terms between bank foreign lending and borrower firm characterisitcs. The first four columns mimic those reported in Table 3, for the full sample, with each of the borrower characteristic interacted with the bank foreign CI to total CI variable. The first column is pooled over all loan types. The second column is term loans only. The third column is credit lines only. The third column is real loans only. The final four columns repeat the analysis, but add in a ForeignTaxToSales variable representing the global operation of the firm along with an interaction term between this variable and bank foreign CI to total CI. t-Statistics are reported below the estimated coefficients. Significance at the 5% level are highlighted in bold.

Base Rate = LIBOR	**Full Sample (1985 - 2013)**				**Full Sample (1985 - 2013)**			
	All Loans	**Term Loans**	**Credit Loans**	**Real Loans**	**All Loans**	**Term Loans**	**Credit Lines**	**Real Loans**
ForeignToTotalCI	3.620	33.319	-23.438	-51.395	41.335	103.001	1.453	-8.668
	0.13	0.56	-0.98	-1.28	1.41	1.62	0.06	-0.21
TotCItoAssets	31.287	5.410	45.659	39.512	14.405	10.328	36.274	24.840
	1.85	0.14	**3.13**	1.73	0.80	0.24	**2.30**	1.04
Cap Ratio	-104.329	22.971	-122.174	-88.905	-183.540	-157.457	-167.951	-215.225
	-1.17	0.10	-1.73	-0.74	-1.93	-0.67	**-2.18**	-1.65
Log Assets	-0.500	-4.087	-0.242	1.162	-1.493	-4.463	-1.230	-0.247
	-0.40	-1.37	-0.22	0.75	-1.11	-1.42	-1.03	-0.15
Firm Leverage	143.952	98.250	122.436	127.011	141.472	100.406	116.469	129.395
	15.01	**6.20**	**14.24**	**8.94**	**13.78**	**6.08**	**12.48**	**8.37**
Firm Cashflow	0.130	0.233	0.122	0.143	0.355	0.193	0.392	0.574
	2.14	0.53	**2.09**	**1.98**	0.80	0.35	0.86	1.18
Firm Size	-27.679	-15.109	-29.183	-25.863	-26.716	-11.812	-28.766	-24.980
	-34.13	**-7.21**	**-43.62**	**-24.27**	**-28.79**	**-4.94**	**-37.94**	**-20.36**
Firm Altman Z	-9.621	-13.496	-7.732	-6.325	-9.052	-12.507	-7.755	-5.949
	-5.08	**-4.05**	**-4.63**	**-3.31**	**-4.68**	**-3.76**	**-4.33**	**-3.19**
CrossCILeverage	30.433	-13.513	21.702	133.609	16.728	-31.652	16.499	97.066
	1.03	-0.28	0.93	**2.85**	0.53	-0.64	0.66	1.90
CrossCICashflow	-2.761	-9.594	-2.047	-3.897	-4.179	-9.632	-3.346	-7.371
	-1.69	**-2.34**	-1.33	-1.67	-1.95	**-2.24**	-1.44	**-2.08**
CrossCISize	5.137	5.445	7.358	9.289	-0.394	-7.972	3.469	3.639
	2.20	0.83	**3.85**	**2.81**	-0.15	-1.06	1.62	0.93
CrossCIAltmanZ	-16.919	-19.763	-11.631	-14.909	-16.101	-19.935	-9.806	-13.327
	-2.77	-1.76	**-2.24**	-1.64	**-2.54**	-1.78	-1.74	-1.41
ForeignTaxToSales					-396.954	-1901.558	-297.002	-509.368
					-3.00	**-3.95**	**-2.99**	**-3.46**
CrossCIForeignTax					625.678	4880.003	447.493	762.905
					1.37	**2.79**	1.30	1.27
Constant	229.598	302.885	224.148	175.458	255.514	295.030	251.025	214.588
	6.55	4.67	7.70	3.71	6.94	4.37	7.95	4.61
Obs	20004	4093	15003	10894	17030	3562	12700	9274
Adj R-sq	0.43	0.29	0.48	0.43	0.43	0.30	0.48	0.43

Table 9: Multinational Firms and Heckman Selection

OLS Regression results of base rate over LIBOR spreads on bank and firm characteristics using a Global Bank Dummy and results of a Heckman Selection model used to address firm selecting to borrow from global banks. Global banks are defined as those in the top 25% of foreign CI to total CI. This table mimics Table 7, the only difference being the addition of a ForeignTaxToSales variable, intended to capture the extent of international firm operations. The first columns reports the pooled sample. The second column reports the subsample of Term Loans only. The third column reports the results from Credit Lines only. The fourth column reports the results from Real Loans only. The fifth column reports results from a first-stage Probit regression of firm characteristics on the bank global dummy. The sixth column reports the second stage results of the Heckman Selection model, with Lambda being the coefficient on the Inverse Mills Ratio. t-Statistics are reported below the estimated coefficients. Significance at the 5% level are highlighted in bold.

Base Rate = LIBOR	**Pooled Regression**				**Probit**	**Heckit**
	All Loans	**Term Loans**	**Credit Lines**	**Real Loans**	**Bank Global Dummy**	**Rate over Libor**
BankGlobalDummy	6.842	16.783	4.306	11.106		12.434
	2.52	**2.70**	**2.07**	**2.94**		**2.45**
TotCItoAssets	15.288	20.525	33.796	23.718		14.826
	0.87	0.49	**2.17**	1.01		0.34
Cap Ratio	-178.674	-75.923	-168.163	-195.542		-212.441
	-1.81	-0.31	**-2.13**	-1.46		-1.30
Log Assets	-0.732	-3.436	-0.801	-0.059		0.241
	-0.62	-1.22	-0.74	-0.04		0.17
Firm Leverage	146.956	94.238	120.137	153.638	0.508	164.386
	19.14	**8.65**	**17.10**	**13.92**	**4.99**	**6.92**
Firm Cashflow	-0.201	-0.768	-0.086	-0.340		-0.980
	-0.56	-1.02	-0.26	-0.68		-0.93
Firms Size	-26.583	-14.065	-27.506	-23.993	0.318	-15.729
	-39.59	**-7.82**	**-52.28**	**-27.06**	**20.90**	-1.48
Firm Altman Z	-12.349	-16.906	-9.782	-8.573	-0.036	-15.996
	-5.72	**-4.93**	**-5.16**	**-3.82**	**-3.73**	**-6.96**
ForeignTaxToSales	-243.635	-521.868	-194.155	-326.124	5.402	-182.376
	-2.58	**-2.08**	**-2.62**	**-3.31**	**2.10**	-0.58
Lambda						63.945
						1.46
Constant	244.796	294.458	239.398	201.278	-3.276	219.912
	6.89	4.54	7.78	4.48	-14.28	1.34
Adj. R-sq	0.43	0.30	0.48	0.43		
Obs	17030	3562	12700	9274		
Avg yearly R-sq					0.16	0.36
Avg yearly Obs					891	685

A Appendix

Claim 1 **Proof.** Suppose instead that the contract was (r, c) with $c > 0$. Then, the bank could offer a contract $(r + \frac{(1-p^L)\epsilon}{p^L}, c - \epsilon)$. This would leave the L type's utility (and thus, incentives) unchanged. In addition, this would reduce the H type's incentives to deviate to the contract (since the H type prefers collateral to interest in comparison to the L type). In addition, this new contract changes the banks profits by $p^L \frac{(1-p^L)\epsilon}{p^L} - (1-p^L)m_b\epsilon = (1-p^L)(1-m_b)\epsilon > 0$. This implies that there would be a profitable deviation for any low type contract with $c_b^L > 0$. Therefore $c_b^L = 0$ for all b. The zero profit condition then dictates that $r_b^L = \frac{K_b}{p_L}$. $\blacksquare$

Claim 2

Proof. The logic for the proof is outlined here (it follows Mas-Colell, Whinston, and Green Lemma 13.D.5). The idea is that Inequality 13 places a lower bound on the amount of collateral required for any given r_b^H. Indeed, it must hold with equality, otherwise the bank could increase profits by decreasing c_b^H and increasing r_b^H much in the same way as the proof of Claim 1. The proof then follows from solving the system of equations given from the binding constraint 13 and the zero profit condition for the high type, Equation 8.

$$K_b = p^L r_b^H + (1-p^L)c_b^H \quad (16)$$

$$K_b = p^H r_b^H + (1-p^H)m_b c_b^H \quad (17)$$

$\blacksquare$

Claim 3

Proof. It is sufficient to show that $\eta^{H*} > \eta^{L*}$. And as shown in the text, this implies that it is sufficient to show $\eta_H^* > K_G - K_D$. Note that adding $(1-p^H)(1-m_b)c_b^H$ to Equation 8 yields:

$$p^H r_b^H + (1-p^H)c_b^H = K_b + (1-p^H)(1-m_b)c_b^H \quad (18)$$

Consequently:

$$\begin{aligned}
\eta_H^* &= p^H r_G^H + (1-p^H)c_G^H - p^H r_D^H - (1-p^H)c_D^H && (19)\\
&= K_G - K_D + (1-p^H)(1-m_G)c_D^H - (1-p^H)(1-m_D)c_D^H && (20)
\end{aligned}$$

Therefore, to show that $\eta_H^* > K_G - K_D$ it is enough to show that $(1-p^H)(1-m_b)c_G^H > (1-p^H)(1-m_b)c_D^H$. Using the expression for collateral in the H contract from Claim 2:

$$\begin{aligned}
(1-p^H)(1-m_G)c_G^H &> (1-p^H)(1-m_D)c_D^H && (21)\\
\Leftrightarrow \frac{K_G(1-m_G)}{(1-p^L)p^H-(1-p^H)p^L m_G} &> \frac{K_D(1-m_D)}{(1-p^L)p^H-(1-p^H)p^L m_D} && (22)
\end{aligned}$$

We have that $K_G \geq K_D$ by assumption. Therefore, it is sufficient to show that $\Omega \equiv \frac{(1-m)}{(1-p^L)p^H-(1-p^H)p^L m}$ is decreasing in m. Differentiating, we get:

$$\frac{\partial \Omega}{\partial m} = \frac{p^L - p^H}{[(1-p^L)p^H-(1-p^H)p^L m]^2} < 0 \qquad (23)$$

$\blacksquare$