Who Borrow More from "Deep-Pocket" Banks? Theory and Evidence from China

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Abstract

Banks commonly differ in their capacities of refinancing borrowers who run into financial distress. Such heterogeneity affects both banks’ pricing policies and firms’ borrowing decisions. By virtue of a game-theoretical model, we show that banks with “deeper pockets” (higher risk-bearing capacities) charge higher interest rates under otherwise identical conditions while offer more rescue credit to borrowers when they encounter financial difficulties. Firms balance the cost and the access to rescue credit when making borrowing decisions. In equilibrium, firms with insufficient cash flow or fewer financing sources borrow more from deep-pocket banks. We then test the heterogeneity of banks’ risk-bearing capacities and the equilibrium implications using a unique loan data from the largest 17 Chinese commercial banks. The empirical results lend strong support to our theoretical viewpoint.

Keywords: bank heterogeneity, risk-bearing capacity, multiple banking, debt structure.

JEL: G21, G32.

1 Introduction

Multiple yet asymmetric borrowing is a common characteristic of bank debt structure of firms around the world. Existing evidence on firms of different sizes in United States (Petersen and Rajan 1994; Guiso and Minetti 2010), European countries (Guiso and Minetti 2010; Ongena et al. 2012, 2013), and Asian countries (Aoki and Patrick 1994) consistently suggests that firms typically do not seek loans across lenders indifferently, but borrow large amounts of money from one main lender and smaller amounts from others. By endogenizing borrowers' financing share across lenders, a handful of recent studies argue that multiple but asymmetric banking reflect to some extent firms' optimal response to banks' heterogeneity in bargaining power (Elsas et al. 2004) or information advantage (Guiso and Minetti 2006; Bannier 2007; Bolton et al. 2016).[1]

In this paper, we propose and test a new mechanism for the formation of multiple yet asymmetric borrowing. Different from previous studies, the primitive assumption of our argument is that banks differ in their abilities to extend rescue credit to borrowers who run into financial distress. To gain access to a larger amount of bank financing in case of a distress, a representative firm tends to build a closer relationship with the deep-pocket bank by borrowing more money from it in good times. The deep-pocket bank, as a response, exploits its bargaining advantage and requests a high compensation for its larger risk exposure. When the interest rate charged by each bank is endogenously determined by the bank's relative market position, the deep-pocket bank always supplies loans at a higher interest rate than does the small bank, and the firm balances the benefits and costs of borrowing from the

[1]Early papers on multiple banking such as Detragiache et al. (2000), Carletti (2004), and Carletti et al. (2007) proceed on the assumption that borrowing is evenly distributed, which apparently does not conform with the worldwide borrowing pattern. Assuming the heterogeneity in banks' abilities to renegotiate debt repayment, Elsas et al. (2004) show that asymmetric borrowing is optimal regarding the balance between the risk of banks' coordination failure and the rent extraction by the bank with full bargaining power. Assuming the heterogeneity in banks' private information, Guiso and Minetti (2006) and Bannier (2007) find that asymmetric borrowing results from the trade-off between the benefit of the signaling function and rent extraction by the bank possessing the most precise information. All these studies preclude the heterogeneity of banks' risk-bearing capacities, which is an independent aspect of bank heterogeneity that has received relatively little formal attention.

deep-pocket bank in the allocation of bank financing. In equilibrium, firms in need of more buffer to cope with potential distress or firms with fewer financing sources borrow more from the deep-pocket bank.

Despite the usual tractability in theoretical analysis of borrowing decisions, the empirical inquiries on the determinants of borrowing allocation are not that easy, mainly because in order to observe the borrowing allocation precisely, we need information that is comprehensive enough to cover all of the borrower's outstanding bank debt. Information from only a single bank cannot support such an identification. In the empirical part of this study, we use a unique Chinese bank loan data for privately-owned listed firms spanning from January 2007 through December 2012 to examine the validity of the theoretical analysis. Our data set, provided by the regulatory body of the Chinese banking sector, covers all bank loans extended by the largest 17 commercial banks (the "big five" banks plus the 12 joint-stock banks) to large industrial firms, which enjoyed an over 80% share of the loan market. Beyond comprehensiveness, the Chinese data are well suited for testing our theoretical analysis for three more reasons. First, the Chinese bond market is undeveloped and bank loans are the overwhelming source of firms' external financing (Ayyagari et al. 2010). Second, there is systematic difference in the risk-bearing capacities of Chinese banks. Indeed, China's banking sector is dominated by the big five state-owned commercial banks. Under the same capital adequacy requirement, the big difference in the size of bank assets indicates that the big five banks can diversify individual firms' default risks more efficiently than the 12 joint-stock banks. Third, China's industrial firms are exposed to a large refinancing risk due to the uncertain and turbulent business environment brought on by the country's rapid economic transition (Khanna and Yafeh 2007). Therefore, increasing the potential for bank financing in times of distress should be a major strategy for most firms.

Based on our data set, we develop five pieces of evidence to support our theoretic analysis. The first two pieces of evidence are devoted to examining the heterogeneity of banks' risk-bearing capacities. As listed firms in China rarely go into bankruptcy (Peng, Wei and Yang

2011; Fan, Huang and Zhu 2013), we use two types of events to indicate a firm's financial distress: one is that the firm is designated as a special treatment (ST) firm, facing the risk of delisting; the other is that the firm defaults on its bank loans. Using a difference-in-difference approach, we compare the amounts of loans approved by different banks before and after these events. After controlling for firm-specific characteristics, we find that the big five banks extend more credit to distressed borrowers than do the 12 joint-stock banks.

The next piece of evidence is regarding our prediction on interest rates. One shortcoming of our data set is that it does not contain information on loan interest rates charged by banks. We overcome this shortcoming by examining a firm's net interest expenses (interest expenses minus interest revenue), which is available in the firm's balance sheet. After controlling for the size of the inter-corporate transaction using both regression analysis and propensity score matching method, we show that given the same amount of total borrowing, the financial expense is higher for firms who borrow more from the big five banks. This evidence provides support for our prediction.

The fourth piece of evidence supports our predictions on the determinants of the borrowing allocation. Compared with firms whose cash holdings or profitability are low, firms with high cash holdings and high profitability rely less on bank financing and thus tend to borrow more from small joint-stock banks. We use both a portfolio analysis and a multivariate regression analysis to confirm this prediction. In addition, we document that larger firms, older firms, and firms located in more developed regions allocate their borrowing more evenly. This is consistent with our prediction that firms rely less on large banks when the non-bank financing sources become cheaper.

One particularly interesting feature of our data set is that it covers the 2008-2009 global financial crisis, which enables us to see whether the borrowing pattern changes during the financial crisis.[2] As a leading export-driven economy, China was over-dependent on exports

[2]Although the financial crisis in U.S. started from fourth quarter of 2007, its influence on Asian countries began in 2008. We thus follow Campello, Graham and Harvey (2011) to set 2008-2009 as the global crisis years.

to stimulate its economic growth before 2008. The sudden decline in external demand during the recent financial crisis threatened many Chinese industrial firms with the risk of running out of cash (Liu 2009; Zhang 2009). It is thus reasonable to hypothesize that during the crisis, Chinese firms valued their bank relationships more than in the past. In addition, the evaporation of liquidity increased the cost of external funds during the crisis, which in turn made non-bank financing sources more expensive. Both of these concerns enhanced the big five banks' relative advantage during the financial crisis. According to our theoretic analysis, we expect that all firms, especially the smaller ones, allocated their borrowing more to the big five banks during the crisis than in the past. The last piece of evidence offers a strong support to this prediction.

This paper makes three contributions to the literature. First, we offer a new explanation for the formation of multiple but asymmetric borrowing, which is especially applicable to developing countries where the banking sector is not fully competitive and banks differ greatly in their risk capacity. Different from the multiple lender literature on information heterogeneity (Brunner and Krahnen 2008), our model starts from the heterogeneity of banks' risk capacity.[3] Second, we add to the literature on debtors' corporate choices (Ayyagari, Demirgüç-Kunt and Maksimovic 2010; Ongena, Tümer-Alkan and Vermeer 2013) by showing both theoretically and empirically that avoiding rent extraction by large creditors with a monopolistic advantage is an important consideration in borrowers' decision-making. Finally, we are among the first to document changes in firms' bank debt structure during the recent global financial crisis in emerging economies such as China.

[3] In particular, the comparison of our model with Bolton et al. (2016)'s study is as follows: (1) They assume information asymmetry while we suppress the role of information asymmetry but assume the heterogeneity lies in risk-bearing capacity. Accordingly, their bank's decision for second period is based on screening and perfect knowledge of firm type. Their continuation lending is only available for good firms. In contrast, our bank's second-period decision is driven by their incentive to recoup the old loan. (2) In their model, banks are fully competitive and makes zero profit. The higher interest rates of relationship banks is driven by their monitoring cost and their cost of holding the buffer. However, in our model, the higher interest rate is driven by their monopolistic position and their higher risk-bearing capacity. Regarding information asymmetry, informational problem is mitigated due to the nature of national banks (all banks in our study is not a regional or local bank).

The remainder of this paper is organized as follows. In Section 2, we present the model and in Section 3, we derive the testable hypotheses. In Section 4, we discuss the background of the Chinese loan market. The data and variables are described in Section 5. In Section 6, we document the differences in banks' lending behaviors and in Section 7, we test our predictions on the determinants of asymmetric bank borrowing. The paper concludes in Section 8. All technical proofs are in the Appendix.

2 The Theoretical Model

Banks differ markedly in their capacities for bearing risks. Large banks usually have more assets, better technology, vaster sources of capital, and a stronger workforce (Nakamura 1994). They are able to construct better diversified portfolios, implement more sophisticated risk management, and accumulate larger reserves to take on more risks. In contrast, small banks have a cost or revenue disadvantage due to the absence of economies of scale. They have to concentrate on selected market segments and exploit their comparative advantage in lending to "soft information" firms (Berger, Miller and Petersen 2005). Such a locally constrained basis inevitably makes default risks hard to diversify, making small banks highly vulnerable to individual risks (Mercieca, Schaeck and Wolfe 2007).[4]

Risk capacity determines, at least to some extent, a bank's lending behavior towards distressed borrowers. When a client firm encounters financial distress and defaults on bank loans, the bank can choose either to liquidate the firm or to help it get out of trouble. Refinancing a troubled firm helps the firm recover from poor performance, which in turn helps the bank recover the principal and regain the interest.[5] However, refinancing a distressed

[4]There are other factors beyond risk capacity that determine the risk-taking behavior of banks. Among others, Saunders, Strock and Travlos (1990) find that stockholder controlled banks have an incentive to take greater risk than managerially controlled banks; Mian (2003) find that for government-owned banks, the soft budget constraints make bank management lax about their risk exposure, leading to high default rates; La Porta, Lopez-de-Silanes and Shleifer (2002) and Dinç (2005) show that government-owned banks can increase political lending to help politicians further their political goals.

[5]Refinancing a distressed borrower also enhances an enduring bank-borrower relationship, which has the potential to generate profits in the long term. For example, Bharath, Dahiya, Saunders and Srinivasan

firm increases the bank's risk exposure. This trade-off suggests that when the net profit of refinancing a defaulted firm is larger than zero, a higher risk capacity and the resulting risk tolerance would increase the likelihood of approving new loans to the firm.

In this section, we propose a game-theoretic model to study the impact of banks' heterogeneous risk capacities on corporate borrowing decisions. For simplicity, the banking system in the model consists of two banks: a large bank (bank L) and a small bank (bank S). Banks decide the interest rates charged on their loans, while borrowers allocate the borrowing between the two banks.[6] Note that we allow for the firm to borrow from a single bank if doing so gains more benefit. That is, we allow for corner solution (corner solution can appear as an outcome).

2.1 Investment opportunities

Suppose that a new firm, who is a potential borrower, enters the market. It has chances to operate for two periods. At time 0, the firm needs to borrow money to finance its project, the outcome of which will be realized at time 1. With probability p_1, the project succeeds and the firm operates without any borrowed money in the second period. This yields a total profit w_1. With probability $1-p_1$, the project fails. In this case, the firm encounters financial distress and needs to borrow additional funds to initiate a continuation project.

The continuation project succeeds with probability p_2. If it succeeds, it returns w_2 at time 2. w_2 is large enough so that the firm can repay all the outstanding debt after the success. If, on the other hand, the project fails, the firm has no opportunity to try again and goes bankrupt.[7] We normalize the money required for the first project to unit, and denote

(2007) find that the bank-borrower relationship increases the likelihood of winning the borrower's future loan business and other related fee-generating services.

[6] From an empirical standpoint, Guiso and Minetti (2010), Ongena, Tümer-Alkan and Westernhagen (2012) and Ongena, Tümer-Alkan and Vermeer (2013) study the determinants of firms' bank debt structure. Their results support the view that the degree of concentration in borrowing is a corporate decision.

[7] To simplify matters, we lay out a two-period model where period 1 denotes the normal regime and period 2 denotes the distress regime. If the firm encounters distress, it has no cash to repay the first-period loan, and moreover, its continuing project has a bad prospect and would generate negative expected profit. Thus, no new banks would like to lend to the firm in distress and only the lender involved in period may

the money required for the second project by l.

2.2 Financing sources

In addition to bank debt, the new firm has an alternative external financing source. The availability of the non-bank source gives the firm the freedom to choose the amount of bank borrowing. The borrowing cost from the non-bank source, which is exogenous to the model, is a convex function of the amount raised. Here, convexity captures that marginal financing cost is usually increasing in the fund size (Kaplan and Zingales 1997). To facilitate tractability, we follow Kaplan and Zingales (2000) and employ a quadratic form for the cost function:

$$c(x) = \frac{\delta}{2}x^2 + \gamma x, \quad \delta > 0, \quad \gamma > 0,$$

where x denotes the fund size, $\gamma = c'(0)$ specifies the minimal marginal cost, and $\delta = c''(x)$ measures the increasing rate of the marginal cost.

We will look for an equilibrium where the firm resorts to the non-bank source only when it fails in the first project (i.e., when it suffers financial distress). Such an equilibrium is consistent with the general viewpoint that bank loans are typically a cheaper form of external financing due to the interbank competition (Denis and Mihov 2003; Hackbarth, Hennessy and Leland 2007). This type of equilibrium arises when the credit quality of the first project is high enough that all banks prefer to set their interest rates below γ (see Assumption 2 below).

opt to lend with the expectation of recover its sunk cost. To capture the latter incentive, we assume that the payoff of the new project is skewed, in the sense that the success probability is quite small, but once the firm succeeds, it is able to cover loans of both periods (Otherwise, even the old bank will never lend to the firm again).

2.3 Renegotiation in Distress

Our main concern in this model lies in the equilibrium allocation of borrowing at time 0. Accordingly, we simplify the renegotiation process at time 1.

Formally, let the interest rate charged by bank i, the amount of the loan granted by bank i for the two projects, be r^i, $\hat{r}^i$, α^i, and $\hat{\alpha}^i$, respectively. At time 1, when the first project fails, the firm defaults on the loans extended in the first period. In order to resolve distress, the firm initiates a second project and applies for new loans to support it. The bank then must choose whether to liquidate the firm or finance the second project. Since banks can get repayment of both loans if the second period project succeeds, they have an incentive to extend the new loan. If the firm is liquidated, the bank loses the principal and gets $-\alpha^i$.[8] If, instead, the bank extends $\hat{\alpha}^i$ at interest rate $\hat{r}^i$ to finance the second project, the bank has probability p_2 of receiving $\alpha^i r^i + \hat{\alpha}^i \hat{r}^i$ (both loans are paid conditional on the success of the second period project) and probability $1 - p_2$ of losing $(\alpha^i + \hat{\alpha}^i)$. In this case, the expected net profit is $p_2(\alpha^i r^i + \hat{\alpha}^i \hat{r}^i) - (1 - p_2)(\alpha^i + \hat{\alpha}^i)$.

At time 1, for a loan contract $(\hat{\alpha}^i, \hat{r}^i)$ to be renegotiation-proof, it must satisfy a set of incentive-compatibility conditions. The first condition is:

$$\hat{r}^i < \frac{1 - p_2}{p_2}, \quad i = L, S, \tag{1}$$

which guarantees that banks cannot make a positive profit on the new loan itself so that banks' risk-bearing capacity will play a determinant role in the refinancing decision.[9] Under this condition, no banks are willing to provide credit if they are not involved in the first project. Anticipating this result, the firm acknowledges that in order to gain access to bank

[8] In practice, loans are usually collateralized and banks have the highest priority for the residual value once the firm is liquidated. Part of the principal and accrued interest can thus be recovered. However, introducing an exogenous recovery rate into the model just complicates the analysis without changing the main insights. We therefore follow Thakor and Wilson (1995) to set the recovery rate to zero.

[9] The expected profit of extending the new loan equals $\hat{\alpha}^i[\hat{r}^i p_2 - (1 - p_2)]$, which is smaller than zero under (1). A violation of this condition will produce a positive profit on the new loan, which may encourage banks to compete on extending new loans to the distressed firm. This consequence is counterintuitive.

credit after the failure of the first project, it must establish a borrowing relationship with the bank as early as in the first period.

The next two conditions are derived from the perspective of the bank. One condition concerns the expected profit, which is written as:

$$p_2(\alpha^i r^i + \hat{\alpha}^i \hat{r}^i) - (1 - p_2)(\alpha^i + \hat{\alpha}^i) \geq -\alpha^i, \quad i = L, S. \tag{2}$$

This condition ensures that refinancing the second project always yields a higher net profit than liquidating the firm. The other condition concerns the default risk. Due to the supervised capital requirement and banks' intrinsic risk appetite, banks are generally averse to increasing their exposures to distressed firms (VanHoose 2007). This suggests that that there will be an upper limit on the amount of the loan that a bank can make to the defaulted firm. We model this constraint as:

$$\hat{\alpha}^i \leq \alpha^i \lambda^i, \quad i = L, S, \tag{3}$$

where $\lambda^i > 0$ is an exogenous parameter specifying bank i's risk capacity. λ^i is determined by bank i's capital productivity and portfolio diversification, and hence it can be assumed to be insensitive to firm-specific characteristics. We keep $\lambda^L > \lambda^S$ throughout our analysis, which amounts to saying that the large bank has a higher capacity for bearing the default risk than the small bank. The upper limit in (3) is proportional to α^i, capturing the intuition that banks' desire to recover the sunk cost is stronger when their investment in the first project is larger.[10]

The last incentive-compatibility condition reflects the firm's incentive. Given the cost function of the non-bank funds, it is optimal for the firm to borrow from banks as much as possible when the interest rate charged by banks does not exceed γ. If the interest rate is

[10] In a model of coordination failure, Schüle (2007) finds that the roll-over decision of a relationship bank is positively related to its financing share in the earlier period. This result offers a rationale for our assumption.

higher than γ, the optimal financing strategy will involve a trade-off between bank loans and non-bank funds. To highlight the value of bank relationships to a financially distressed firm, we assume that the firm can successfully lower the interest rate below γ in the renegotiation. That is, the firm requires:

$$\hat{r}^i \leq \gamma, \quad i = L, S. \tag{4}$$

Under this condition, the firm will borrow the largest amount available from banks, i.e.,

$$\hat{\alpha}^i = \alpha^i \lambda^i, \quad i = L, S. \tag{5}$$

In principle, every contract satisfying (1) through (5) can be a reasonable outcome of the renegotiation, depending on the firm's bargaining power. To simplify the analysis, we assume that (4) and (5) are binding in the bargaining procedure. In other words, we let $(\hat{\alpha}^i, \hat{r}^i) = (\alpha^i \lambda^i, \gamma)$ $(i = L, S)$ be the final solution of the loan renegotiation. This solution provides the firm with a strong incentive to establish a relationship with the large bank at time 0.[11] Assumption 1 gives the necessary and sufficient conditions for $(\alpha^i \lambda^i, \gamma)$ to meet (1) through (5).

Assumption 1: $\gamma < \frac{1-p_2}{p_2}$, $\lambda^S < \lambda^L \leq \frac{1}{\frac{1-p_2}{p_2} - \gamma}$, and $\lambda^L < l$.

We are now in a position to find r^i and α^i $(i = L, S)$ in the equilibrium. Using backward induction, we address three questions: (1) Anticipating banks' lending behavior at time 1, how does the firm allocate its borrowing at time 0? (2) Given the firm's borrowing strategy, how does each bank react to its competitor's strategy? (3) What is the equilibrium outcome taking into account both the firm and the banks' strategies?

[11] The aim of our model is to formulate the trade-off between the benefit and the cost of the relationship with the large bank. For this purpose, we highlight the benefit of the large bank in the loan renegotiation. Our main insight does not rely on the specific bargaining process, as long as the large bank remains more valuable than the small bank in the renegotiation.

2.4 Question 1: The firm's borrowing strategy

In this subsection, we examine how the firm allocates its borrowing at time 0. For the first project, suppose that the firm borrows α^i from bank i. Then, the firm anticipates two consequences. With probability p_1, the first project succeeds, and the profit is $w_1 - \alpha^L r^L - \alpha^S r^S$. With probability $1 - p_1$, the first project fails. In this case, under Assumption 1, the firm receives $\alpha^L\lambda^L + \alpha^S\lambda^S$ from banks and raises $l - \alpha^L\lambda^L - \alpha^S\lambda^S$ from the alternative funding channel. The total profit over the two periods is:

$$\begin{aligned}\Pi^{\text{firm}} =& p_1 \left[w_1 - \alpha^L r^L - \alpha^S r^S\right] \\ &+ (1-p_1)p_2 \left[w_2 - \alpha^L\left(r^L + \lambda^L\gamma\right) - \alpha^S\left(r^S + \lambda^S\gamma\right) - c\left(l - \alpha^L\lambda^L - \alpha^S\lambda^S\right)\right].\end{aligned}$$

Assuming $r^S < r^L < \gamma$, the firm maximizes the total profit by solving:[12]

$$\begin{aligned}&\max_{\alpha^L,\alpha^S} \quad \Pi^{\text{firm}} \\ &s.t. \quad \alpha^L + \alpha^S = 1, \quad \alpha^L \geq 0, \quad \alpha^S \geq 0.\end{aligned} \tag{6}$$

For notational simplicity, we introduce $\Lambda = \frac{(1-p_1)p_2}{p_1+(1-p_1)p_2}$, the success probability of the second project divided by the overall success probability of both projects.

In Lemma A.1 in the Appendix, we characterize the firm's optimal borrowing allocation when r^L and r^S are given. It confirms that, in order to gain a share in the loan market, the small bank has to discount its interest rate (i.e., $r^S < r^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L)$), and the large bank has to keep its interest rate in excess of that charged by the small bank below a certain threshold (i.e., $r^L < r^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S)$). The optimal financing share of the large bank, α^L_{opt}, is a decreasing function of $r^L - r^S$. When the magnitude of $r^L - r^S$ is small relative to the difference in risk capacity, the firm prefers to borrow only from the large

[12] We verify that $r^S < r^L < \gamma$ is satisfied automatically in the equilibrium under Assumption 2 below in the proof of Proposition 1.

bank. As the magnitude of $r^L - r^S$ increases, the firm reduces its borrowing from the large bank while increasing its borrowing from the small bank. When the magnitude of $r^L - r^S$ becomes large relative to the difference in risk capacity, the firm will eventually borrow only from the small bank.

2.5 Question 2: Banks' reaction functions

In this subsection, we examine how each bank reacts to its competitor's strategy. For bank i, given the firm's borrowing strategy α^i_{opt}, it has probability p_1 of winning $\alpha^i_{\text{opt}} r^i$ conditional on the success of the first project, probability $(1-p_1)p_2$ of winning $\alpha^i_{\text{opt}}(r^i + \lambda^i\gamma)$ conditional on the success of the second project, and probability $(1-p_1)(1-p_2)$ of losing $\alpha^i_{\text{opt}}(1+\lambda^i)$ conditional on the failure of both projects. The total expected profit is:

$$\Pi^i = \alpha^i_{\text{opt}} \left[(p_1 + (1-p_1)p_2) r^i - (1-p_1)(1-p_2) + (1-p_1)(p_2\gamma - (1-p_2))\lambda^i \right]. \tag{7}$$

Each bank maximizes its profit by choosing the optimal interest rate, taking the interest rate charged by the other bank as given. It is easily seen from equation (7) that the actuarially fair interest rate is:

$$r^i_0 = \Lambda \left[\frac{1-p_2}{p_2} + \left(\frac{1-p_2}{p_2} - \gamma \right) \lambda^i \right],$$

with which the net profit of extending a loan will be zero. For ease of presentation, we introduce:

$$\Gamma = \left[\frac{l - \frac{1}{\delta}\left(\frac{1-p_2}{p_2} - \gamma\right) - \lambda^S}{\lambda^L - \lambda^S} \right]. \tag{8}$$

Lemma A.2 in the Appendix displays the large bank's reaction to the small bank's pricing policy. Overall, α^L_{opt} is an increasing function of r^S. When r^S is small, the large bank has to offer a low interest rate in order to attract the firm. This makes the bank lose money given that it will extend a new loan at the proportion λ^L when the first project fails. In this case, the large bank offers the actuarially fair interest rate but in fact gains a zero market share. When r^S is moderate, the large bank makes a profit by charging an interest rate that is increasing in r^S. When r^S becomes large enough, the small bank loses its price advantage and the large bank becomes the lender of choice.

Lemma A.3 in the Appendix displays the small bank's reaction to the large bank's pricing policy. Similar to the large bank, r^S_{opt} is an increasing function of r^L.

2.6 Question 3: The equilibrium outcome

In this subsection, we examine the equilibrium outcome taking into account both the firm and the banks' strategies. The two banks maximize their respective profits in a simultaneous-move Nash game. The equilibrium interest rates for the first project must satisfy equations (A.1) and (A.2) simultaneously. To ensure that the equilibrium interest rates are smaller than γ, we make Assumption 2.

Assumption 2: Λ is small enough such that $\Lambda\left[\frac{1-p_2}{p_2}\left(1+\lambda^L\right)+\delta(\lambda^L-\lambda^S)(l-\lambda^S)\right]<\gamma$.

The main result is presented in the following proposition.

Proposition 1. *Under Assumptions 1 and 2, the borrowing game has the following unique pure strategy Nash equilibrium:*

(i) When $\Gamma \leq -1$, the large bank sets $r^L_{opt} = r^L_0$, the small bank sets $r^S_{opt} = r^S_0 - \delta\Lambda(\lambda^L-\lambda^S)^2\Gamma$, and the firm borrows exclusively from the small bank;

(ii) When $-1 < \Gamma < 2$, the large bank sets $r^L_{opt} = r^L_0 + \frac{1}{3}\delta\Lambda(\lambda^L-\lambda^S)^2(1+\Gamma)$, the small bank sets $r^S_{opt} = r^S_0 + \frac{1}{3}\delta\Lambda(\lambda^L-\lambda^S)^2(2-\Gamma)$, and the firm borrows

$$\alpha^L_{opt} = \frac{1+\Gamma}{3} \tag{9}$$

from the large bank and $\alpha^S_{opt} = \frac{2-\Gamma}{3}$ *from the small bank.*

(iii) When $\Gamma \geq 2$*, the large bank sets* $r^L_{opt} = r^L_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma - 1)$*, the small bank sets* $r^S_{opt} = r^S_0$*, and the firm borrows exclusively from the large bank.*

Recalling that $\Lambda = \frac{(1-p_1)p_2}{p_1+(1-p_1)p_2}$, Assumption 2 will hold true when the credit quality of the first project is high enough that p_1 is sufficiently larger than $(1 - p_1)p_2$. Figure 1 illustrates the equilibrium with a plausible parameter setting under which both Assumptions 1 and 2 hold true: $l = 1.0$, $p_1 = 0.8$, $p_2 = 0.7$, $\lambda^L = 0.8$, $\lambda^S = 0.3$, $\delta = 0.9$, and $\gamma = 0.4$. In this illustration, the equilibrium interest rates are $r^L_{\text{opt}} = 9.3\%$ and $r^S_{\text{opt}} = 7.2\%$, and the optimal borrowing share from the large bank is $\alpha^L_{\text{opt}} = 77.9\%$.

Insert Figure 1 around here.

Proposition 1 characterizes the equilibrium outcome. By inspection of equation (8), we see that Case (i) occurs when either l or δ is sufficiently small. In this case, the large bank loses its capacity appeal either because the firm only has a small shortage of cash or because the non-bank financing source is sufficiently cheap. As a response, the firm borrows exclusively from the small bank. Case (iii) occurs when either l or δ is sufficiently large. In this case, the firm has a severe shortage of cash or the non-bank financing source becomes too expensive. The small bank loses its market share due to its low capacity for financing the subsequent project. Case (ii) occurs when l and δ are moderate such that Γ is neither too small nor too large. In this case, the firm borrows from both banks, and the borrowing allocation reflects the firm's balance between current borrowing costs and subsequent access to credit.

Before proceeding to the empirical results, we make four comments on the key features of the above theoretical analysis. First, different from the multiple lender literature that mainly keeps to information heterogeneity (Brunner and Krahnen 2008), our model starts from the heterogeneity of banks' risk capacity, precluding any possible issues related to information asymmetry. In the empirical tests, to mitigate the impact of informational problems, we focus only on publicly traded firms.

Second, in our model, maximizing profit is the unique objective of both firms and banks. We thus preclude any other factors such as political connection that may affect the allocation of financial resources (Sapienza 2004; Dinç 2005). To mitigate the effects of government ownership on bank lending, we further exclude state-owned firms in the empirical tests and use only privately-owned listed firms.

Third, we predict that large banks offer loans at a higher interest rate than do small banks. We stress that this strategy does not challenge the general view that loans made by large banks are less costly thanks to economies of scale. In fact, the latter view is based on an implicit assumption that the loan market is fully competitive and the relationships with different banks are equally valuable to borrowing firms. By contrast, large banks in our model share more risks with borrowers and possess monopolistic power from their capacity advantage.

Finally, different from the literature on syndicated loans (Holmstrom and Tirole 1997; Sufi 2007), the banks in our model behave non-cooperatively and face no coordination problem. This is realistic given conditions in the Chinese bank loan market during the period we study.

3 Testable Hypotheses

The equilibrium derived in Section 2 has several empirical implications on the allocation of bank borrowing, which are summarized in Proposition 2. Note that these implications are equilibrium-based and have taken into account the joint-determination of firms' borrowing decisions and banks' reactions.

Proposition 2. *For the equilibrium shown in Proposition 1, we have* $r^L_{opt} > r^S_{opt}$*. Moreover,* $\frac{\partial \alpha^L_{opt}}{\partial l} > 0$*,* $\frac{\partial \alpha^L_{opt}}{\partial \delta} > 0$*, and* $\frac{\partial \alpha^L_{opt}}{\partial \gamma} > 0$*.*

The first prediction posited in Proposition 2 is $r^L_{\text{opt}} > r^S_{\text{opt}}$, i.e., large banks offer loans at a higher interest rate than do small banks. There are two reasons for this. One is that large banks require more compensation for their higher risk exposure incurred potentially in the subsequent distress. The other is that large banks can opportunistically exploit their bargaining advantage. Both facts push up the interest rate charged by large banks. This prediction does not challenge the general view that loans made by large banks can be cheaper due to economies of scale, because in our model relationships with different banks have different values. When the relationships become comparable, i.e., $\lambda^S \to \lambda^L$, the relative advantage of large banks disappears and both r^L_{opt} and r^S_{opt} collapse to the zero-profit interest rate. The above discussion leads us to Hypothesis 1 below.

Hypothesis 1: Compared with small banks, large banks give greater support to borrowers in hard times, but charge higher interest rates on the loans extended in normal times.

The next four predictions concern the optimal financing share of large banks. $\frac{\partial \alpha^L_{\text{opt}}}{\partial l} > 0$ demonstrates that firms tend to borrow more from large banks if they need more external funds to recover from potential distress. This result captures the intuition that firms rely more on bank relationships if they expect to encounter a severe cash shortage. We relate l to a firm's cash holding level and profitability level. In fact, researchers have consistently found that cash is an effective liquidity buffer when market frictions prevent firms from raising external finance (Faulkender and Wang 2006; Sufi 2009). As a result, firms with high levels of cash are more likely to have a smaller l. The corporate structure literature generally supports that firms with higher profitability have more internal funds and make less use of debt (Titman and Wessels 1988; Elsas, Flannery and Garfinkel 2014). Other things being equal, a higher profitability level will result in a smaller l. Hypothesis 2 below sums up these two considerations.

Hypothesis 2: The financing share of large banks decreases with the firm's cash holding level and profitability level.

$\frac{\partial \alpha^L_{\text{opt}}}{\partial \delta} > 0$ and $\frac{\partial \alpha^L_{\text{opt}}}{\partial \gamma} > 0$ clarify that there is a positive relationship between the optimal financing share of large banks and the cost of the non-bank source. The intuition behind this result is apparent, as bank loans are more valuable when the alternative financing source becomes more costly, and consequently firms in this situation rely more heavily on large banks. We thus have Hypothesis 3.

Hypothesis 3: The financing share of large banks is larger when the alternative financing source is more expensive.

One interesting feature of our sample is that it covers the 2008-2009 global financial crisis. This offers us one more opportunity to test our predictions. Economists have documented two stylized facts about the 2008-2009 global financial crisis. One is that many investments in new projects were restricted during the crisis due to an unexpected credit shortage (Campello, Graham and Harvey 2010). This restriction was particular severe for Chinese listed firms because China was traditionally an export-driven economy. The sudden decline in external demand exposed many Chinese industrial firms to the risk of running out of cash (Liu 2009; Zhang 2009). This fact suggests that l should be larger during the crisis than in non-crisis periods. The other fact is that the severe decline in liquidity increased the cost of external funds during the crisis (Bliss, Cheng and Denis 2015), which implies that δ or γ should also be higher during the crisis. According to Proposition 1, the increases in l, δ, and γ during the crisis all indicate that firms should borrow more from large banks during a financial crisis than they do during non-crisis periods. Therefore, we posit Hypothesis 4.

Hypothesis 4: The financing share of large banks is larger during the financial crisis than during non-crisis periods.

Our model, as well as its testable hypotheses, complements the literature on asymmetric banking. In their Table 2, Ongena, Tümer-Alkan and Westernhagen (2012) summarize the relevant hypotheses developed in previous studies. All hypotheses therein are build upon the trade-off arising from information asymmetry and moral hazard. As a result, none of them points out the difference in the lending behavior when borrowers become distressed. Those hypotheses are also silent on the effects of cash holdings and alternative financing sources.

4 Institutional Background

We test our model predictions using a unique Chinese bank loan data for listed firms spanning from January 2007 through December 2012. The Chinese data are particularly well suited for testing our model for three reasons.

First, like many other bank-based economies such as Germany and Japan (Hoshi, Kashyap and Scharfstein 1990; Ongena, Tümer-Alkan and Westernhagen 2012), the banking sector constitutes the most important part of the financial system in China. According to the Monetary Policy Report issued by People's Bank of China, bank loans are the primary source of external financing for industrial firms, accounting for 75% of all external funds raised by China's nonfinancial sector by the end of 2012. The Chinese bond market is quite small and undeveloped. It is difficult for firms to access long-term financing from the small corporate bond market (Qian, Tian and Wirjanto 2009). Bank loans thus become a relatively cheap source for external financing (Ayyagari, Demirgüç-Kunt and Maksimovic 2010).

Second, the Chinese banking system is still underdeveloped, and banks differ considerably in their risk-bearing capacity. Indeed, China's banking sector is dominated by the big five state-owned commercial banks, which account for more than 40% of the banking sector assets in 2012. Although the 12 joint-stock commercial banks represent the second largest group of banks in China, their combined market share in terms of banking sector assets is still below 20% (Fungáčová, Pessarossi and Weill 2013). This indicates a low level of competition in the Chinese banking sector. Under the same capital adequacy requirement, the big difference in the size of assets indicates that the big five banks can diversify individual firms' default risks more efficiently than the 12 joint-stock banks.

Third, China's industrial firms are exposed to a large refinancing risk due to the uncertain and turbulent business environment brought on by the rapid economic transition (Khanna and Yafeh 2007). Given the limited alternative financing sources, increasing the opportunities for regaining bank financing in times of distress should be a major consideration for most firms.

China initiated its economic reform in 1978. Between 1979 and 1984, four state-owned banks—Agricultural Bank of China, Bank of China, China Construction Bank, and Industrial and Commercial Bank of China—were established to serve the financing needs of agriculture, foreign trade, infrastructure construction, and manufacturing industries, respectively. After 1984, these "big four" banks were allowed to enter other lines of business. In 1987, the earliest state-owned joint-stock bank in China—Bank of Communications—was established. This bank subsequently became the largest joint-stock bank and the fifth largest commercial bank in China. In the 1990s, 12 more joint-stock commercial banks, including China Merchants' Bank, Pudong Development Bank, and Shenzhen Development Bank, were established. These 12 banks are much smaller in size compared with the "big five" counterparts (the four state-owned banks plus the Bank of Communications), but they were endowed with better corporate governance and more economic freedom (Jia 2009). To further separate commercial banking activities from policy lending activities, three policy banks were created in 1994 to take over the policy loans and the big five banks were oriented towards operating on a commercial basis.

China has made persistent effort towards transforming the existing banks into market-based commercial institutions. Although the banking sector was notorious for bad loans and government intervention before 2004, the situation changed due to the reform process involving bank restructuring and financial liberalization (Firth, Lin, Liu and Wong 2009; Chang, Liao, Yu and Ni 2014).[13] In this process, nonperforming loans in state-controlled banks were cleaned up through disposals and capital injections before 2005; after 2005,

[13] Using bank loans issued by Shanghai and Shenzhen listed companies from January 1999 through December 2004, Bailey, Huang and Yang (2011) find that poorly performing firms were more likely to receive bank loans and their subsequent long-run performance was typically poor.

banks had to bear the operating losses by themselves. In 2003, government intervention was limited through the establishment of the China Banking Regulatory Commission (CBRC), a government agency that took over the supervisory and regulatory functions of the banking sector. Local governments then lost direct authority over banks and their local branches. The CBRC has taken cautionary steps to increase the competitiveness of China's banking industry. Since 2004, it has urged Chinese banks to establish statistical systems for customers with large credits, made the international five-tier loan classification system compulsory for all banks since 2005, limited the scope of related-party lending since 2006, required all banks to track the migration of loans in different categories since 2006, and since 2007 has encouraged the major banks to address international principles such as the Basel Accord. As responses to these measures, all the 17 commercial banks (the big five banks plus the 12 joint-stock banks) established internally unified rating systems by the end of 2008. From then on, loan applications have to pass the approval threshold pre-specified by the system.

Other measures taken by the central government such as flexibilization of interest controls, opening up to foreign competition, capital account liberalization, and strengthening enforcement of bankruptcy through updating the Bankruptcy Law, also enhance commercialization of the banking sector (García-Herrero, Gavilá and Santabárbara 2006; Kargman 2007). All the 17 commercial banks went public in Shanghai or Hong Kong during 2004-2013 and some of them have introduced foreign shareholders.

The Chinese banking sector is large. In 2013, China ranked sixth in terms of bank credit to the private sector worldwide and seventh in terms of bank credit as a percentage of GDP (World Bank Report, 2013). China's bank loan market has attracted increasing attention from academia. Among others, Ayyagari, Demirgüç-Kunt and Maksimovic (2010) analyze a survey data collected by the World Bank in 2003 and find that firms with bank financing grow faster than similar firms with informal financing. Using data on loans to large industrial firms from one of the big five banks in China, Chang, Liao, Yu and Ni (2014) document a substantial decline in loan defaults after the implementation of an internal credit rating system by the bank in 2004. They find that changes in firm-specific financial factors lead to changes in credit ratings. Qian, Strahan and Yang (2015) also confirm that Chinese banks' internal risk rating becomes a stronger predictor of loan interest rates and ex post outcomes after the banking reforms. These findings indicate that commercial principles have been adopted and applied by Chinese loan officers.

5 Data and Variables

Our proprietary data on bank loans are from the CBRC. From January 2007 to December 2012, the CBRC required the top 17 banks (the big five plus 12 joint-stock banks) to record key information on the credit extended to firms with annual credit lines exceeding 50 million RMB. The top 17 banks are highly representative of the providers in the Chinese loan market, since for each year during the sample period, they enjoyed an over 80% share of the loan market. The CBRC collected the amount of credit extended to each client firm, the size, the issue date, the maturity date, and the repayment date of all newly approved commercial loans. For our study, to mitigate the impact of informational problems, we focus only on publicly traded firms. To mitigate the effects of government ownership on bank lending, we further exclude state-owned firms and use only privately-owned listed firms.[14] We also remove financial services firms, which account for less than 5% of the client firm sample. For selected firms, we retrieve the accounting and price data from the China Stock Market and Accounting Research (CSMAR) database. After excluding observations with any missing variable values, we obtain a final sample consisting of 6,345 firm-year observations. These borrowing firms are big, each having total assets exceeding 339 million RMB.[15]

Our primary variable of interest is *BShare*, the financing share of the big five banks

[14]As in Bailey, Huang and Yang (2011) and Lu, Zhu and Zhang (2012), we classify a firm as a state-owned enterprise (SOE) if its largest shareholder is the state (i.e., the central government, the local government or any other state-owned entity).

[15]The 2003 classification guidelines issued by the State-owned Assets Supervision and Administration Commission of the State Council of China classifies a firm as a "medium-sized or large" industrial firm if its assets exceed 50 million RMB.

calculated as the loans granted by these banks to a firm in one year divided by the sum of the loans granted by all the 17 commercial banks to the firm in the same year. This variable proxies for α^L_{opt} proposed in our model.

To test Hypothesis 2, we use the cash ratio, *Cash/Assets*, defined as total cash and equivalents divided by total assets, to measure a firm's cash holding level. We use earnings per share, *EPS*, the ratio of EBITDA (earnings before interest, taxes, and depreciation) over total assets, *EBITDA/Assets*, and returns on assets, *ROA*, as profitability measures. These three variables are widely used as proxies for firm profitability. We refer to Shen and Lin (2009) for a study that also uses these proxies for Chinese firms.

To test Hypothesis 3, we adopt three variables to proxy for the cost of the non-bank financing source. The first two variables are firm size, *Assets*, and firm age, *Age*. Broadly speaking, the non-bank financing channels in China mainly include informal financing and equity financing. As shown by Allen, Qian and Qian (2005) and Ayyagari, Demirgüç-Kunt and Maksimovic (2010), informal financing, such as borrowing through private money houses and underground organizations, operates on the basis of borrowers' social networks and reputation. Its cost can be lowered if the borrower has an important position in the network or a good reputation. For equity financing, the associated cost is inversely related to the disclosure quality and reputation (Botosan 1997; Srivastava, McInish, Wood and Capraro 1997). Since smaller firms and younger firms commonly have smaller networks, weaker reputations, and are more informationally opaque, it is natural to expect that the cost of non-bank financing is higher for these firms than for larger and older firms. The third variable is the marketization index, *Marketi*, developed by Fan, Wang and Zhu (2011), which indicates the progress of the transition towards the market economy in each province. Prior studies have found that in China, a higher marketization level implies more convenient access to credit from financial intermediaries, a more liberalized market, better legal protection, and stronger contract enforcement (Firth, Lin, Liu and Wong 2009). Marketization reduces the market friction in financial trading and makes financing channels more competitive. Therefore, the cost of non-bank funds is presumably lower in regions that are more marketized.[16]

We also include several control variables that are necessary to our study. First, we include the yearly growth rate of sales, *Sales Growth*, to control for a firm's growth prospects, which may influence banks' lending decisions (Chang, Liao, Yu and Ni 2014).

Second, we control for the effects of relationship-based information superiority that may affect the loan granting. Relationship banking is one way to resolve agency and information issues between lenders and borrowers. It helps banks obtain and accumulate borrower-specific proprietary information, which in turn increases banks' willingness to renegotiate and to lend (Boot 2000; Bodenhorn 2003; Puri, Rocholl and Steffen 2011). To proxy for a relationship-based information advantage, when performing firm-bank-level studies, we use the duration of the relationship between a specific firm and a specific bank measured as the number of months since the firm first borrowed from the bank as a proxy; when performing firm-level studies, we use the average duration of the firm's relationships with all big five banks as a proxy. We also include the number of lending banks, *No. Banks*, to control for the potential effects of the coordination problem arising from relationships with multiple banks (Elsas, Heinemann and Tyrell 2004).

Third, we control for the supply-side determinants. Indeed, the top 17 banks covered by our database are large enough to satisfy all the loan requests of any given listed firm.[17] Nevertheless, the loan granting decision can be affected by banks' credit conditions and their taste for diversification. To control for these potential effects, we follow Ongena, Tümer-Alkan and Westernhagen (2012) to include two supply-side variables: the average of the big five banks' capital adequacy ratio, *BCapital*, and the average of their total assets, *BSize*, in

[16] One may argue that a higher marketization also implies a higher level of competition among banks. However, the 17 banks in our sample are all national-wide banks, and they are equally competitive across regions. We measured the competitiveness among banks in a province using the ratio of the assets of small joint-stock banks in the province over the total bank assets in the same province. This ratio changed only slightly over provinces.

[17] The average yearly assets of the 12 joint-stock banks is 1,479 billion RMB, while the largest yearly loan request of a listed firm is around 620 million RMB. The former is 2,385 times larger than the latter. It is thus reasonable for us to assume that borrowing from multiple banks is a corporate decision.

our regressions. These two variables are available quarterly.

Finally, we use *GDP Growth*, the regional quarterly gross domestic product growth, to control for the macroeconomic condition. We also add year fixed effects and industry fixed effects into all the regressions to account for the heterogeneity of operating industries and temporal shocks.[18]

Table 1 presents summary statistics for the variables described above. To minimize the effect of outliers, all continuous variables are winsorized.[19] The majority of the firms borrow far more from large banks than from small banks. The median of *BShare* is 0.811, indicating that more than half of firms allocate more than 80% of their bank debt to large banks. The mean duration of a bank relationship is 2.5 years, and the average firm gets credit from three banks. The financial characteristics vary substantially across firms: the total assets vary from 0.3 billion RMB to 46 billion RMB; the leverage varies from 0.08 to 0.99; and the intangibility ratio varies from 0 to 0.8. The capital adequacy ratios of the big five banks are rather stable over our sample period. The difference between the maximum value and the minimum value accounts for less than 17.6% of their mean values. The big five banks grow rapidly, and their average total assets increase to around 12,000 billion RMB in 2012, which is 2.5 times larger than in 2007.

Insert Table 1 around here.

Table 2 reports the correlation coefficients for the variables defined above. The correlations between the variables that proxy for different firm characteristics are slight, but the correlations between the variables that proxy for the same firm characteristic are high, providing cross validation for the effectiveness of our proxy variables.[20] We also compute the variance inflation factor (VIF) to test for potential multicollinearity among the variables,

[18]Firms' industry and sector are based on two-digit Standard Industry Classification (SIC) codes published by National Bureau of Statistics of China (2010), which is broadly consistent with the international standard.

[19]The results are robust to different winsorizing criteria. To be concise, only the results based on 1% and 99% winsorizing are reported.

[20]For example, log(*Assets*), *EPS*, *EBITDA/Assets* and *ROA* are highly correlated, consistent with the intuition that large firms are usually highly profitable.

except for *BShare*. The largest VIF value is 5.39, which is far below the rule of thumb cutoff of 10.0 for multiple regression models. This confirms that multicollinearity is not a serious issue in our study.

Insert Table 2 around here.

6 Heterogeneity of Banks' Lending Behaviors

In this section, we examine Hypothesis 1. We first assess whether large banks give greater support to distressed borrowers than do small banks. Next, we examine whether large banks are more expensive than small banks.

6.1 Accounting Characteristics: Large Banks vs. Small Banks

In Table 3, we compare the big five banks (large banks) and the 12 joint-stock banks (small banks). Panel A shows the differences in banks' accounting characteristics, where the statistics are drawn from banks' annual reports and the Bankscope database. Apparently, the big five banks are significantly larger than joint-stock banks. During the sample period, the average assets of the big five banks is 9,750 billion RMB (about 1,570 billion U.S. dollars), which is 6.6 times larger than the average assets of small banks, which is 1,480 billion RMB. The average market share of the big five banks is 11.61%, which is 7.4 times larger than the average share of small banks, which is 1.57%. The size and share advantages give big five banks the capacity to diversify better than the small banks do. However, although the big five banks have higher capital adequacy ratios, their nonperforming loan ratios are more than twice those of small banks, and their returns on equity are smaller than those of small banks. These facts seem to suggest that better diversification by large banks does not translate into risk reductions, although it does provide incentives for them to pursue riskier lending opportunities (Demsetz and Strahan 1997).

Insert Table 3 around here.

Panel B of Table 3 shows the borrower level results. Among the 6,345 firm-year observations, there are 3,286 observations where firms borrow exclusively from only one type of bank. Sorting these observations according to their lending banks, we see from Panel B1 that firms borrowing from the big five banks obtain significantly larger annual credit lines, as well as significantly more loans. The average size of the loans granted by the big five banks is 1.62 times larger than that of the loans granted by the joint-stock banks. In the remaining 3,059 observations, firms borrow simultaneously from both types of banks. These firms are larger in size than those who borrow only from one type of banks. For these observations, Panel B2 shows that the average size of the loans granted by the big five banks is 1.74 times larger than that of the loans granted by the joint-stock banks. In both panels B1 and B2, the default ratio for loans approved by the big five banks is significantly higher than that for loans approved by small banks.[21] Overall, the descriptive statistics shown in Table 3 indicate that in China, the big five banks dominate the market. They offer more financing to clients and take more risks.

6.2 Risk Capacity: Large Banks vs. Small Banks

We first identify the events indicating when a firm enters financial distress. Two kinds of events provide valid distress signals. One is that a firm is designated as a special treatment (ST) firm. Starting from April 1998, China's Securities Regulatory Commission, the regulatory body of Chinese securities market, started delisting firms that had lost money for three consecutive years. To monitor troubled firms, the stock exchanges designate firms that report a net loss (a negative ROE) in two consecutive years as "Special Treatment" ("ST") firms. ST firms have to be traded with a stricter price limit, hire external auditing companies for their midterm reports, and stop raising additional capital from the stock

[21] Throughout the paper, "default" is a standard industry definition referring to going bankrupt or three months' delinquency (Jiménez and Saurina 2004). This international standard is employed by the CBRC office. See the CBRC file (No. 2007.54) "Guidelines on Loan Risk Classification" for a classification.

market (Peng, Wei and Yang 2011). Given these constraints, most firms would try to avoid being labeled as an ST firm. The other signal for financial distress is that a firm defaults on loans. Throughout the sample period, all the 17 banks implemented the so-called "clawback system," which required loan officers to assume personal responsibility for the repayment of the loans they granted, even if they had been transferred to another entity. As a result, all loan officers have to be more watchful for borrowers in default.

Table 4 reports the results of loan granting around the ST designation. The sample consists of 320 observations of ST designations for firms covered by both the CBRC database and the CSMAR database for the 2007 to 2012 period. Panel A reports the average size of the loans approved before and after the ST designation with different event windows, where we sort the observations into two equal-sized groups according to the value of *BShare*. From the 7-month window, we see that for firms who borrow more from large banks (the group with high *BShare*), the average size of the loans approved in three consecutive months increases from 28.54 million RMB before the ST designation to 33.76 million RMB after the ST designation. For firms who borrow less from large banks (the group with low *BShare*), the average size of approved loans decreases from 21.08 million RMB before the ST designation to 15.49 million RMB after the ST designation. The difference in the changes in loan size between the two groups is 10.81 million RMB, significant at the 5% level. A similar contrast is also observed with a 13-month window surrounding the event month, where the difference in the loan reductions between the high *BShare* group and the low *BShare* group is 9.41 million RMB, significant at the 1% level. To control for the selection bias induced by banks' different screening technologies, we further focus on the subsample covering 198 firms who borrow simultaneously from both big banks and small banks. For both the 7-month and 13-month windows, the difference in the loan reductions between the two types of banks is also significant both statistically and economically with the expected positive sign.

Insert Table 4 around here.

Next, we control for the cross-sectional variation by estimating a linear regression model using firm-level observations. The model is specified as follows:

$$\begin{aligned}\Delta\log(Loan)_i =& \alpha_1 BShare_i + \alpha_2 \textit{Firm-specific characteristics}_i \\ &+ \alpha_3 \textit{Relationship-based information superiority}_i \\ &+ \alpha_4 \textit{Macroeconomic conditions} + \alpha_5 \textit{Year and industry fixed effects} \\ &+ Constant + \varepsilon_i, \end{aligned} \tag{10}$$

where the dependent variable is $\Delta\log(Loan)_i$, the natural logarithm of total loans approved after the ST designation minus the natural logarithm of total loans approved before the ST designation. According to our model presented in Section 2, if we assume the periods before and after the ST designation to be period 1 and period 2 respectively, we will get:

$$\Delta\log(Loan) = \log\left(\alpha_{\text{opt}}^L\lambda^L + (1-\alpha_{\text{opt}}^L)\lambda^S\right) - \log(1) = \log\left(\alpha_{\text{opt}}^L(\lambda^L - \lambda^S) + \lambda^S\right).$$

This theoretical relationship between $\Delta\log(Loan)$ and α_{opt}^L suggests the coefficient of *BShare*, α_1, should be positive.

Panel B of Table 4 reports the OLS estimates for regression (10). There are three columns for each event window, where column (1) shows the results of the univariate regression, and columns (2) and (3) incorporate different sets of control variables. The empirical results across the three columns are highly consistent, and most control variables have correctly signed coefficients. In all columns, the coefficient of *BShare* is significant with the expected sign, revealing a positive role of the large bank relationship in the loan approval for ST firms. The role is also significant economically. With the 7-month window, after controlling for all other relevant factors, a 10% increase in *BShare* above its mean value increases the bank credit availability after a ST designation by 0.28 million RMB.[22] Similar results also

[22] Assume that the loan size increases to $Loan'$ when *BShare* increases to $1.1 BShare$. Then, according to our regression equation, there is $\log(Loan') - \log(Loan) = 0.1 \times \alpha_1 \times BShare = 0.011$, which implies

hold true for the 13-month window, with which the corresponding credit gain becomes 0.63 million RMB, accounting for 3.5% (= 0.68/17.98) of the average small bank loans approved after the ST designation.

The results in Table 4 generally support our viewpoint that big banks extend more credit to distressed borrowers. For robustness, we use loan default as an alternative distress signal and study the loan availability subsequent to default. In our database, there are 1,602 firm-bank observations where firms have failed to repay the defaulted loans for at least six months. For a loan default occurring between firm i and bank j, we assign an indicator, denoted by $Availability_{ij}$, with value one if bank j approves a new loan to firm i within six months after the default and zero otherwise. In Table 5, Panel A reports the results of the portfolio analysis, in which we divide the overall observations into two groups based on bank type and compare the mean values of $Availability_{ij}$ from different groups. In both groups, the mean value of $Availability_{ij}$ exceeds 33%, indicating that more than one-third of the defaulted firms obtained new loans before repaying the defaulted ones. The difference is 9%, significant at the 1% level. This shows that the percentage of the defaulted firms that obtain new loans after default is substantially higher when the original lender is a big bank as compared to a small bank.

Insert Table 5 around here.

To control for the cross-sectional variation, we estimate a logistic model relating the loan approval after loan default to the borrower type. The model is:

$$\begin{aligned} Availability_{ij} = & \alpha_1 Bank\ Type_j + \alpha_2 Firm\text{-}specific\ characteristics_i \\ & + \alpha_3 Relationship\text{-}based\ information\ superiority_{ij} \\ & + \alpha_4 Macroeconomic\ conditions + \alpha_5 Year\ and\ industry\ fixed\ effects \\ & + Constant + \varepsilon_{ij}, \end{aligned} \tag{11}$$

$Loan' - Loan = 0.011 Loan.$

where the *Bank Type* dummy indicates whether or not bank j is a big five bank. We cluster the standard errors on bank type when assessing its statistical significance. From Panel B of Table 5, we see that the results for regression (11) across all columns are consistent, and most control variables enter the regression with expected signs. In all columns, the coefficient of bank type is significantly positive, revealing a positive role of bank type in the loan approval process subsequent to default. The role is also economically significant. Having controlled all relevant factors, switching from a small bank to a big bank raises the likelihood of loan approval by 12.2%. This marginal effect is nontrivial given that the mean likelihood of loan approval is 38.5%.[23] The qualitative results remain similar when we use a 12-month window. In sum, our results in Tables 4 and 5 offer considerable support to the hypothesis that large banks are more helpful for borrowers in distress.

6.3 Interest Rates: Large Banks vs. Small Banks

We next examine whether large banks charge higher interest rates when firms have no financial difficulties. For this purpose, we exclude 1,996 observations where firms are financially distressed (i.e., firm-year observations where firms are either ST or defaulting on loans) from our sample and base our analysis on the remaining 4,349 observations.

One shortcoming of the CBRC data set is that it does not contain information on loan interest rates charged by banks. To overcome it, we follow Lu, Zhu and Zhang (2012) to use a firm's net interest expenses (interest expenses minus interest revenue), denoted by *FinExp*, to proxy for the firm's total interest payment. We estimate the OLS regression for

[23]The mean likelihood of loan approval is the probability of $Availability_{ij} = 1$ when all variables in the logistic regression are valued at their sample means. The mean likelihood of loan approval is 31.4% when $Bank\ type_j = 0$ and 43.6% when $Bank\ type_j = 1$. The marginal effect is thus the difference between 31.4% and 43.6%.

the following model:

$$\begin{aligned}\log(\mathit{FinExp})_i =&\alpha_1 \log(\mathit{Loans})_i + \alpha_2 \log(\mathit{Loans})_i \times \mathit{BShare}_i \\ &+ \alpha_3 \log(\mathit{Payable})_i + \alpha_4 \mathit{Firm\text{-}specific\ characteristics}_i \\ &+ \alpha_5 \mathit{Relationship\text{-}based\ information\ superiority}_i \\ &+ \alpha_6 \mathit{Macroeconomic\ conditions} + \alpha_7 \mathit{Year\ and\ industry\ fixed\ effects} \\ &+ \mathit{Constant} + \varepsilon_i, \end{aligned} \tag{12}$$

where *Payable* refers to the accounts payable in the balance sheet. Inspired by Jiang, Lee and Yue (2010), who find that intercorporate loans in China are typically reported as part of "other receivables," we include log(*Payable*) in the regression to control for the effects on the expense brought by intercorporate transactions. Different from loans payable, accounts payable are typically based on services and business transactions. To support that financial expenses are higher when firms borrow more from the big five banks, the sign of α_2 in regression (12) should be significantly positive.

The results for regression (12) are reported in Panel A of Table 6, where standard errors used to assess significance are adjusted for the clustering of observations at the firm level. In column (1), we control for firm size only, and in columns (2) and (3), we include more control variables. The results across the three columns are consistent, and most control variables enter the regression with expected signs. The coefficient of the interaction term log(*Loans*) × *BShare* is positive and significant at the 1% level in column (3). To gain more insight into the effects of bank type on interest expenses, we repeat the regressions of model (12) based on two subsamples, which cover firms borrowing exclusively from either large banks or small banks. Columns (4) and (5) show that other things being equal, a 10% increase in the loan size above its mean value increases the financial expense by 1.02% when a firm borrows from a big five bank and by 0.84% when a firm borrows from a joint-stock bank.[24] This contrast provides evidence that large banks provide more expensive loans.

Insert Table 6 around here.

Last, to relax the linear association between financial expenses, $\log(FinExp)_i$, and the financing share of large banks, $BShare_i$, we follow Michaely and Roberts (2012) and employ a propensity score matching approach. This approach requires us to focus on the subsample of firm-month observations where firms only borrow from one type of banks. To construct the subsample, we first run a probit regression of a dummy variable indicating whether a firm borrows from large banks over the following five independent variables: $\log(Assets)$, *Leverage*, $\log(Loans)$, $\log(Payables)$ and industry-fixed effects. This generates for each firm-month observation the propensity of the firm to borrow from large banks. Then, for each firm-year observation where a firm borrows exclusively from small banks, we look for a unique firm-year observation where a firm borrows exclusively from large banks to match it. The selection criterion is to minimize the absolute value of the difference between the propensity scores. Panel B of Table 6 reports the mean values of various variables for both the subsample of firms borrowing only from small banks and the matched sample. The propensity score matching algorithm gives very good results, and the differences in the four control variables between the original sample and the matched sample all become insignificant. However, the difference in $\log(FinExp)$ is still positive, significant at the 10% level. The difference accounts for 13% of the mean financial expenses of the subsample of firms borrowing only from small banks. This result provides an additional piece of evidence to support Hypothesis 1 that large banks provide more expensive loans.

[24] Assume that the financial expense increases to $FinExp'$ when *Loan* increases to $1.1Loan$. Then, according to our regression equation, $\log(FinExp') - \log(FinExp) = \alpha_2 \log(1.1)$, which implies $FinExp' - FinExp = 0.095 \times \alpha_2 \times FinExp$.

7 Determinants of Corporate Borrowing

In this section, we examine Hypotheses 2 to 5. All the tests are performed on the sample consisting of 4,349 observations where financially distressed firms (i.e., firms are either ST or defaulting on loans) are excluded.

7.1 Portfolio Analysis

We first perform portfolio analysis to examine the relationship between the financing share of the big-five banks and the related firm characteristics. The results are offered in Table 7.

Insert Table 7 around here.

For Hypothesis 2, we divide the full sample into two equal-sized subsamples according to *Cash/Assets*, *EPS*, *EBITDA/Assets*, and *ROA*, and then compare the mean *BShare* for the subsamples using *t*-tests. This sort produces a clear negative relation between *BShare* and all four variables. Regarding *Cash/Assets*, *EPS*, *EBITDA/Assets*, and *ROA*, Table 7 shows that the mean *BShare* of the subsample with values above the median is 11.5%, 10.3%, 15.3%, and 11.4% smaller than that of the subsample with values below the median, respectively. All the differences are significant at the 1% level. These results are consistent with Hypothesis 2 that the financing share of large banks decreases with a firm's cash holding level and its profitability level.

For Hypothesis 3, we divide the full sample into two equal-sized subsamples according to firm size, firm age, and the marketization level of the province where the firm is located. This sort reveals a clear negative relation between *BShare* and all three variables. The mean *BShare* of the large firm subsample is 14.4% smaller than that of the small firm subsample; the mean *BShare* of the old firm subsample is 6.0% smaller than that of the young firm subsample; and the mean *BShare* of the subsample with higher levels of marketization is 3.9% smaller than that of the subsample with lower levels of marketization. All the differences are significant at the 1% level. These facts provide supportive evidence for Hypothesis 4 that the financing share of large banks is larger when the alternative financing source becomes more expensive.

For Hypothesis 4, we divide the full sample into two subsamples according to whether the observation occurs in the crisis years 2008-2009 or the non-crisis years. The mean *BShare* in non-crisis years is 68.4%, and it increases to 71.8% in during the crisis years. The difference is significant at the 1% level. This result provides supportive evidence for Hypothesis 5 that the financing share of large banks is larger during the crisis years than in non-crisis years.

7.2 Regression Analysis

In this subsection, we use regression analysis to test our hypotheses by controlling more variables. The regression model used here is:

$$\begin{aligned} BShare_i = & \alpha_1 Cash/Assets_i + \alpha_2 EPS_i + \alpha_3 EBITDA/Assets_i + \alpha_4 ROA \\ & + \alpha_5 Leverage_i + \alpha_6 Intang/Assets_i \\ & + \alpha_7 \log(Assets)_i + \alpha_8 \log(Age)_i + \alpha_9 Marketi_i \\ & + \alpha_{10} Crisis \\ & + \alpha_{11} \textit{Relationship-based information superiority}_i \\ & + \alpha_{12} \textit{Firm growth prospects}_i + \alpha_{13} \textit{Supply-side determinants} \\ & + \alpha_{14} \textit{Macroeconomic conditions} + \alpha_{15} \textit{Year and industry fixed effects} \\ & + Constant + \varepsilon_i, \end{aligned} \tag{13}$$

where *Crisis* is a dummy variable indicating whether the observation occurs during the crisis years 2008-2009. Notice that when *Crisis* enters the regression, year-fixed effects should be excluded. In regression (13), to provide support for Hypothesis 2, signs on α_1 through α_4 should be significantly negative; to provide support for Hypothesis 4, signs on α_7 through

α_9 should be significantly negative; and to provide support for Hypothesis 5, the sign on α_{10} should be significantly positive. When studying the effects of the recent financial crisis, it is worth mentioning that China announced a four trillion RMB fiscal simulation program in November 2008 and initiated a massive expansion of credit in 2009 in an attempt to sustain domestic economic activity. These policy interventions brought substantial changes to the provision of credit by Chinese banks. The potential effects of these interventions are controlled through the inclusion of the supply-side variables, *BCapital* and *BSize*, in regression (13).

Table 8 displays the univariate regression results, where only regional GDP growth and fixed effects are controlled in the regression. In our assessment of significance, we cluster the standard errors at the firm level. All the explanatory variables of interest enter the regression with expected signs. The corresponding coefficients are all significant at the 1% level.

Insert Table 8 around here.

Table 9 shows the multivariate regression results, where we control for a firm's growth prospect, the effects of relationship-based information superiority, and the supply-side determinants. Standard errors used to assess significance are adjusted for the clustering of observations at the firm level. The control variables have consistent and reasonable signs across all the columns. In particular, the coefficient of log(*Duration*) is positive and significant in all columns, which is aligned with the doctrine that an enduring banking relationship can facilitate the availability of bank credit (Boot 2000). The coefficient of log(*BSize*) is positive, capturing that the big five banks tend to extend more loans when they have more assets. All the main explanatory variables are significant with the expected signs. Regarding economic significance, after controlling for all other relevant factors, a one-standard-deviation increase in *Cash/Assets*, *EPS*, *EBITDA/Assets*, and *ROA* reduces *BShare* by 0.88%, 0.90%, 1.0%, and 4.0% respectively; a one-standard-deviation in log(*Assets*), log(*Age*), and *Marketi* reduces *BShare* by 10.8%, 20.2%, and 0.8% respectively; and switching from a non-crisis period to the financial crisis increases *BShare* by 3.3%. All these results provide supportive evidence for Hypotheses 2 to 4.

Insert Table 9 around here.

Finally, the fact that our data covers the 2008-2009 financial crisis gives us more opportunities to examine our model's prediction. In our model, l represents the expected cash shortage that can occur when a project fails. In practice, the evaluation of l relies on firm managers' forecasts conditional on the current status of a project. Similarly, p_2 denotes the success probability in the long run, which is also a forecast-based variable. Using a survey of chief financial officers (CFOs) in the U.S., Europe, and Asia, Campello, Graham and Harvey (2010) find that many investments in attractive projects were restricted during the recent crisis, and more than half of the respondents said they canceled or postponed their planned investments. Combining survey data with trading records, Hoffmann, Post and Pennings (2013) find that during the crisis, investors' return expectations and risk tolerance decreases, while their risk perceptions increase. Both studies suggest that the arrival of the financial crisis made firm managers' forecasts on l and p_2 more pessimistic than they had been before the crisis. This implies that firms' cash holdings will play a smaller role in reducing their dependence on large banks during a financial crisis, while leverage will play a bigger role in increasing their borrowing from small banks. Therefore, we expect that the reduction in *BShare* as a result of higher cash holdings will be smaller during the crisis than than in non-crisis periods, whereas the reduction in *BShare* as a result of higher leverage will be larger. This suggests that, if the two interaction terms *Cash/Assets*×*Crisis* and *Leverage*×*Crisis* are added to the regression model (13), the sign of *Cash/Assets*×*Crisis* should be positive while the sign of *Leverage*×*Crisis* should be negative. Regarding δ and γ, the firesale of assets during the financial crisis (Bordo 2008) weakened larger firms' relative advantage in external financing, which according to our model should undermine their incentive to borrow from small banks. We thus expect a positive sign of $\log(Assets)\times Crisis$

in the regression.

The results shown in Table 10 confirm our expectation on the interaction terms. In our assessment of significance, we cluster the standard errors at the firm level. It is evident from columns (1) to (3) in Panel A that the interaction terms *Cash/Assets*×*Crisis*, *Leverage*×*Crisis*, and log(*Assets*)×*Crisis* enter the regression with significant and expected signs. We then split the whole sample into two subsamples based on whether the observation occurs in the crisis years 2008-2009 and run separate regressions for the two subsamples. The results shown in Panel B of Table 10 further confirm the expected differences in the coefficients of *Cash/Assets*, *Leverage*, and log(*Assets*) between the subsample for the crisis period and the subsample for the non-crisis periods.

Insert Table 10 around here.

8 Conclusion

In countries where the banking system is not fully competitive, there are obvious differences in lending activities between large banks and small banks. Large banks commonly have more diversified portfolios, acquire more deposits, benefit more from economies of scale and scope, and have better risk management. They have a greater risk capacity and thus can extend more credit to support distressed borrowers. To compete with large banks, small banks who are at a disadvantage in bearing borrowers' financial distress have to lower their interest rates. These differential characteristics create a trade-off for firms when making the borrowing decision.

In the theoretical part of this paper, we formulate the above trade-off. In a simplified banking system consisting of only two banks, the large bank is supposed to have a greater risk capacity. To gain access to more bank credit during difficult periods, the firm has an incentive to borrow more from large banks. However, the large bank requires more compensation for its higher risk exposure and at the same time exploits its bargaining advantage opportunistically.

As a result, the large bank always charges a higher interest rate than does the small bank. In equilibrium, the firm's optimal allocation of bank financing balances the costs and benefits from borrowing from the large bank.

The empirical part of this paper offers considerable support to the above analysis. Using a unique Chinese bank loan data, we document the following facts. First, using the ST designation and loan default as signals for financial distress, we find that large banks extend more credit to distressed firms than small banks. Second, using regression analysis and propensity score matching, we find that firms have higher financial expenses when they borrow more from large banks. Third, using both portfolio analysis and regression analysis, we find evidence supporting that firms borrow more from large banks if they need more external funds to recover from distress, if they have better opportunities to succeed in the long term, or if their non-bank financing sources are more costly. Last, we also confirm that firms borrow more from large banks during the recent crisis than they did before or after the crisis. All these findings are obtained after controlling for the effects of relationship-based information superiority and supply-side determinants.

In sum, we offer a new mechanism for the formation of asymmetric borrowing. We contribute to the literature on bank debt structure by shedding new light on how firms respond to the heterogeneity of banks' risk capacities through their borrowing decision making. For future research, examining whether our theoretic predictions hold in other countries would be valuable. Investigating the determinants of firms' bank debt structure with multiple lenders in broader contexts seems also to be a promising avenue.

Appendix

We offer three technical lemmas in part A, and present the proofs to all lemmas and propositions in part B.

A. Lemmas

Lemma A.1. *Under the assumption $\lambda^S < \lambda^L < l$, the solution to (6) satisfies:*

(i) When $r^L - r^S \leq \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L)$, the solution is $\alpha^L_{opt} = 1$, $\alpha^S_{opt} = 0$;

(ii) When $\delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L) < r^L - r^S < \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S)$, the solution is:

$$\alpha^L_{opt} = \frac{l - \lambda^S}{\lambda^L - \lambda^S} - \frac{r^L - r^S}{\delta\Lambda(\lambda^L - \lambda^S)^2}, \quad \alpha^S_{opt} = \frac{r^L - r^S}{\delta\Lambda(\lambda^L - \lambda^S)^2} - \frac{l - \lambda^L}{\lambda^L - \lambda^S};$$

(iii) When $r^L - r^S \geq \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S)$, the solution is $\alpha^L_{opt} = 0$, $\alpha^S_{opt} = 1$.

Lemma A.2. *Under Assumption 1, the optimal interest rate charged by the large bank with a given r^S, denoted by r^L_{opt}, satisfies:*

(i) When $r^S \leq r^S_0 - \delta\Lambda(\lambda^L - \lambda^S)^2\Gamma$, $r^L_{opt} = r^L_0$. In this case, $\alpha^L_{opt} = 0$ and the corresponding profit also equals zero;

(ii) When $r^S_0 - \delta\Lambda(\lambda^L - \lambda^S)^2\Gamma < r^S < r^S_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(2 - \Gamma)$,

$$r^L_{opt} = \frac{r^S}{2} + \frac{\Lambda}{2}\left[\frac{1 - p_2}{p_2} + \left(\frac{1 - p_2}{p_2} - \gamma\right)\lambda^L + \delta(\lambda^L - \lambda^S)(l - \lambda^S)\right]. \tag{A.1}$$

In this case, $\alpha^L_{opt} \in (0, 1)$ and the corresponding profit is positive;

(iii) When $r^S \geq r^S_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(2 - \Gamma)$, $r^L_{opt} = r^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L)$. In this case, $\alpha^L_{opt} = 1$ and the corresponding profit is positive.

Lemma A.3. *Under Assumption 1, the optimal interest rate charged by the small bank with a given r^L, denoted by r^S_{opt}, satisfies:*

(i) When $r^L \leq r^L_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma - 1)$, $r^S_{opt} = r^S_0$. In this case, $\alpha^S_{opt} = 0$ and the

corresponding profit also equals zero;

(ii) When $r_0^L + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma - 1) < r^L < r_0^L + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma + 1)$,

$$r_{opt}^S = \frac{r^L}{2} + \frac{\Lambda}{2}\left[\frac{1-p_2}{p_2} + \left(\frac{1-p_2}{p_2} - \gamma\right)\lambda^S - \delta(\lambda^L - \lambda^S)(l - \lambda^L)\right], \tag{A.2}$$

the corresponding $\alpha_{opt}^S \in (0,1)$*, and the corresponding profit is positive;*

(iii) When $r^L \geq r_0^L + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma + 1)$, $r_{opt}^S = r^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S)$*. In this case,* $\alpha_{opt}^S = 1$ *and the corresponding profit is positive.*

B. Proofs

Proof of Lemma A.1. Let $\alpha^L = \alpha$ and $\alpha^S = 1 - \alpha$. Simple manipulation yields:

$$\begin{aligned}\Pi^{\text{firm}} \propto & \alpha[p_1 + (1-p_1)p_2](r^L - r^S) - \alpha\delta(1-p_1)p_2(\lambda^L - \lambda^S)(l - \lambda^S) \\ & + \frac{\alpha^2}{2}\delta(1-p_1)p_2(\lambda^L - \lambda^S)^2,\end{aligned}$$

where we drop all terms that are irrelevant to α. This is a quadratic function of α and the optimal solution on $(-\infty, +\infty)$ is:

$$\alpha^* = \frac{l - \lambda^S}{\lambda^L - \lambda^S} - \frac{r^L - r^S}{\delta\Lambda(\lambda^L - \lambda^S)^2}.$$

The optima on the interval $[0,1]$ can be found easily by comparing α^* with 0 and 1. ■

Proof of Lemma A.2. Inserting α_{opt}^L into Π^L, we obtain the following:

(a) If $r^L \in I_1^L \equiv \left(0, r^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L)\right]$,

$$\Pi^L = (1-p_1)p_2\left[\frac{r^L}{\Lambda} - \frac{1-p_2}{p_2} - \left(\frac{1-p_2}{p_2} - \gamma\right)\lambda^L\right];$$

(b) If $r^L \in I_2^L \equiv \big(r^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L), r^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S)\big)$,

$$\Pi^L = (1 - p_1)p_2 \left[\frac{l - \lambda^S}{\lambda^L - \lambda^S} - \frac{r^L - r^S}{\delta\Lambda(\lambda^L - \lambda^S)^2}\right] \left[\frac{r^L}{\Lambda} - \frac{1 - p_2}{p_2} - \left(\frac{1 - p_2}{p_2} - \gamma\right)\lambda^L\right];$$

(c) If $r^L \in I_3^L \equiv \big[r^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S), +\infty\big)$, $\Pi^L = 0$.

On I_1^L, Π^L is linear and increasing in r^L. Globally, it attains zero at:

$$r^L_{\text{root1}} = \Lambda\left[\frac{1 - p_2}{p_2} + \left(\frac{1 - p_2}{p_2} - \gamma\right)\lambda^L\right].$$

Note that r^L_{root1} is the actuarially fair interest rate with which the net profit of extending a loan is zero. On I_2^L, Π^L is quadratic in r^L. Globally, it has two zero roots. One is r^L_{root1} and the other is:

$$r^L_{\text{root2}} = r^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S).$$

Note that r^L_{root2} is the interest rate with which the large bank loses all its market share. Π^L attains its maximum value at:

$$r^L_m = \frac{r^L_{\text{root1}} + r^L_{\text{root2}}}{2} = \frac{r^S}{2} + \frac{\Lambda}{2}\left[\frac{1 - p_2}{p_2} + \left(\frac{1 - p_2}{p_2} - \gamma\right)\lambda^L + \delta(\lambda^L - \lambda^S)(l - \lambda^S)\right].$$

We differentiate between three cases.

(i) If $r^L_{\text{root1}} \geq r^L_{\text{root2}}$, it follows $\Pi^L < 0$ for all $r^L \in I_1^L \cup I_2^L$. In this case, r^S is too small so that the large bank is at a price disadvantage even if it charges the actuarially fair interest rate. The large bank has to choose r^L_{root1} and the resulting profit is zero.

(ii) If $r^L_{\text{root1}} < r^L_{\text{root2}}$, the optimal interest rate charged by the large bank depends on the relative position of r^L_m and the right endpoint of I_1^L.

(ii-1) When r^S is moderate, r^L_m lies to the right of the right endpoint of I_1^L. In this case, the optimal interest rate is r^L_m, and both banks enjoy a nonzero market share.

(ii-2) When r^S is large, r^L_m lies to the left of the right endpoint I^L_1. In this case, the optimal interest rate is the right endpoint of I^L_1. The small bank loses its price advantage and the large bank wins the whole market.

Note that:

$$r^L_{\text{root1}} \geq r^L_{\text{root2}} \Leftrightarrow r^S \leq r^S_0 - \delta\Lambda(\lambda^L - \lambda^S)^2\Gamma,$$
$$r^L_m \leq r^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L) \Leftrightarrow r^S \geq r^S_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(2 - \Gamma),$$

our lemma follows straightforwardly from the above discussion. ■

Proof of Lemma A.3. Inserting α^S_{opt} into Π^S, we obtain the following:

(a) If $r^S \in I^S_1 \equiv \big(0, r^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S)\big]$,

$$\Pi^S = (1 - p_1)p_2 \left[\frac{r^S}{\Lambda} - \frac{1 - p_2}{p_2} - \left(\frac{1 - p_2}{p_2} - \gamma\right)\lambda^S\right];$$

(b) If $r^S \in I^S_2 \equiv \big(r^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S), r^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L)\big)$,

$$\Pi^S = (1 - p_1)p_2 \left[\frac{r^L - r^S}{\delta\Lambda(\lambda^L - \lambda^S)^2} - \frac{l - \lambda^L}{\lambda^L - \lambda^S}\right]\left[\frac{r^S}{\Lambda} - \frac{1 - p_2}{p_2} - \left(\frac{1 - p_2}{p_2} - \gamma\right)\lambda^S\right];$$

(c) If $r^S \in I^S_3 \equiv \big[r^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L), +\infty\big)$, $\Pi^S = 0$.

On I^S_1, Π^S is linear and increasing in r^S. Globally, it attains zero at:

$$r^S_{\text{root1}} = \Lambda\left[\frac{1 - p_2}{p_2} + \left(\frac{1 - p_2}{p_2} - \gamma\right)\lambda^S\right].$$

Note that r^S_{root1} is the actuarially fair interest rate with which the net profit of extending a loan is zero. On I^S_2, Π^S is quadratic in r^S. Globally, it has two zero roots. One is r^S_{root1} and the other is:

$$r^S_{\text{root2}} = r^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L).$$

Note that r^L_{root2} is the interest rate with which the small bank loses all its market share. Π^S attains its global maximum value at:

$$r^S_m = \frac{r^S_{\text{root1}} + r^S_{\text{root2}}}{2} = \frac{r^L}{2} + \frac{\Lambda}{2}\left[\frac{1-p_2}{p_2} + \left(\frac{1-p_2}{p_2} - \gamma\right)\lambda^S - \delta(\lambda^L - \lambda^S)(l - \lambda^L)\right].$$

We differentiate between three cases.

(i) If $r^S_{\text{root1}} \geq r^S_{\text{root2}}$, it follows $\Pi^S < 0$ for all $r^S \in I^S_1 \cup I^S_2$. In this case, r^L is too small so that the small bank is at a price disadvantage even if it charges the actuarially fair interest rate. The small bank has to choose r^S_{root1} and the resulting profit is zero.

(ii) If $r^S_{\text{root1}} < r^S_{\text{root2}}$, the optimal interest rate charged by the small bank depends on the relative position of r^S_m and the right endpoint of I^S_1.

- (ii-1) When r^L is moderate, r^S_m lies to the right of the right endpoint of I^S_1. In this case, the optimal interest rate is r^S_m and both banks enjoy a nonzero market share.
- (ii-2) When r^L is large, r^S_m lies to the left of the right endpoint of I^S_1. In this case, the optimal interest rate will be the right endpoint of I^S_1. The large bank becomes too expensive and the small bank wins the whole market.

Note that

$$r^S_{\text{root1}} \geq r^S_{\text{root2}} \Leftrightarrow r^L \leq r^L_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma - 1),$$
$$r^S_m \leq r^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S) \Leftrightarrow r^L \geq r^L_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma + 1),$$

our lemma follows straightforwardly from the above discussion. ■

Proof of Proposition 1. We first offer the interior solution to the system of equation (A.1) and equation (A.2), which is a candidate of the equilibrium. Let

$$A = \frac{\Lambda}{2}\left[\frac{1-p_2}{p_2} + \left(\frac{1-p_2}{p_2} - \gamma\right)\lambda^L + \delta(\lambda^L - \lambda^S)(l - \lambda^S)\right],$$
$$B = \frac{\Lambda}{2}\left[\frac{1-p_2}{p_2} + \left(\frac{1-p_2}{p_2} - \gamma\right)\lambda^S - \delta(\lambda^L - \lambda^S)(l - \lambda^L)\right],$$

and then equations (A.1)-(A.2) reduce to:

$$r^L_{\text{opt}} = \frac{r^S_{\text{opt}}}{2} + A, \quad r^S_{\text{opt}} = \frac{r^L_{\text{opt}}}{2} + B,$$

the unique solution of which is:

$$r^L_{\text{opt}} = \frac{4A + 2B}{3} = r^L_0 + \frac{1}{3}\delta\Lambda(\lambda^L - \lambda^S)^2(1 + \Gamma),$$
$$r^S_{\text{opt}} = \frac{2A + 4B}{3} = r^S_0 + \frac{1}{3}\delta\Lambda(\lambda^L - \lambda^S)^2(2 - \Gamma).$$

To ensure that the above is the equilibrium, we only need to verify that r^L_{opt} and r^S_{opt} satisfy the following

$$r^S_0 - \delta\Lambda(\lambda^L - \lambda^S)^2\Gamma < r^S_{\text{opt}} < r^S_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(2 - \Gamma),$$
$$r^L_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma - 1) < r^L_{\text{opt}} < r^L_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma + 1),$$

which hold true if and only if $-1 < \Gamma < 2$. Inserting r^L_{opt}, r^S_{opt} into α^L_{opt} and α^S_{opt}, we are led to assertion (ii) of this proposition. To prove (i), note that when $\Gamma \leq -1$, there must be

$$r^L_{\text{opt}} \geq r^L_0 \geq r^L_0 + \delta\Lambda(\lambda^L - \lambda^S)^2(\Gamma + 1).$$

According to (iii) of Lemma A.3,

$$
\begin{aligned}
r_{\text{opt}}^S =& r_{\text{opt}}^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S) \\
=& r_{\text{opt}}^L - r_0^L + r_0^S - \delta\Lambda(\lambda^L - \lambda^S)\Gamma \geq r_0^S - \delta\Lambda(\lambda^L - \lambda^S)\Gamma.
\end{aligned} \tag{B.1}
$$

If $r_{\text{opt}}^L > r_0^L$, there will be $r_{\text{opt}}^S > r_0^S - \delta\Lambda(\lambda^L - \lambda^S)\Gamma$. According to Lemma A.2, this implies:

$$
r_{\text{opt}}^L = \frac{r_{\text{opt}}^S}{2} + \frac{\Lambda}{2}\left[\frac{1-p_2}{p_2} + \left(\frac{1-p_2}{p_2} - \gamma\right)\lambda^L + \delta(\lambda^L - \lambda^S)(l - \lambda^S)\right]
$$

or $r_{\text{opt}}^L = r_{\text{opt}}^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L)$. Neither of them has a solution satisfying $r_{\text{opt}}^L > r_0^L$ when (B.1) is combined with. Accordingly, the unique equilibrium will be $r_{\text{opt}}^L = r_0^L$ and $r_{\text{opt}}^S = r_0^S - \delta\Lambda(\lambda^L - \lambda^S)\Gamma$. In this case, $\alpha_{\text{opt}}^L = 0$ and $\alpha_{\text{opt}}^S = 1$. To prove (iii), note that when $\Gamma \geq 2$, there must be

$$
r_{\text{opt}}^S \geq r_0^S \geq r_0^S + \delta\Lambda(\lambda^L - \lambda^S)^2(2 - \Gamma).
$$

According to (iii) of Lemma A.2,

$$
\begin{aligned}
r_{\text{opt}}^L =& r_{\text{opt}}^S + \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L) \\
=& r_{\text{opt}}^S - r_0^S + r_0^L + \delta\Lambda(\lambda^L - \lambda^S)(\Gamma - 1) \geq r_0^L + \delta\Lambda(\lambda^L - \lambda^S)(\Gamma - 1).
\end{aligned} \tag{B.2}
$$

If $r_{\text{opt}}^S > r_0^S$, there will be $r_{\text{opt}}^L > r_0^L + \delta\Lambda(\lambda^L - \lambda^S)(\Gamma - 1)$. According to Lemma A.3, this implies:

$$
r_{\text{opt}}^S = \frac{r_{\text{opt}}^L}{2} + \frac{\Lambda}{2}\left[\frac{1-p_2}{p_2} + \left(\frac{1-p_2}{p_2} - \gamma\right)\lambda^S - \delta(\lambda^L - \lambda^S)(l - \lambda^L)\right]
$$

or $r_{\text{opt}}^S = r_{\text{opt}}^L - \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S)$. Neither of them has a solution satisfying $r_{\text{opt}}^S > r_0^S$ when (B.2) is combined with. Accordingly, the unique equilibrium will be $r_{\text{opt}}^L = r_0^L + \delta\Lambda(\lambda^L -$

$\lambda^S)(\Gamma - 1)$ and $r_{\text{opt}}^S = r_0^S$. In this case, $\alpha_{\text{opt}}^L = 1$ and $\alpha_{\text{opt}}^S = 0$. Finally, we verify that Assumption 2 ensures $r_{\text{opt}}^L, r_{\text{opt}}^S < \gamma$. Recalling Equation (8), we have $\frac{l-\lambda^S}{\lambda^L-\lambda^S} - \frac{\frac{1}{\delta}\left(\frac{1-p_2}{p_2}\right)}{\lambda^L-\lambda^S} \le \Gamma \le \frac{l-\lambda^S}{\lambda^L-\lambda^S}$. With this bound, it is straightforward to show that under Assumption 2, there is $r_{\text{opt}}^L, r_{\text{opt}}^S < \gamma$. ■

Proof of Proposition 2. By definition, we have:

$$r_0^L - r_0^S = \Lambda\left(\frac{1-p_2}{p_2} - \gamma\right)(\lambda^L - \lambda^S) = \delta\Lambda(\lambda^L - \lambda^S)^2\left(\frac{l-\lambda^S}{\lambda^L - \lambda^S} - \Gamma\right).$$

This, together with the derivation in Proposition 1, yields:

$$r_{\text{opt}}^L - r_{\text{opt}}^S = \begin{cases} \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^S), & \text{if } \Gamma \le -1, \\ \delta\Lambda(\lambda^L - \lambda^S)^2\left(\frac{l-\lambda^S}{\lambda^L-\lambda^S} - \frac{1+\Gamma}{3}\right), & \text{if } -1 < \Gamma < 2, \\ \delta\Lambda(\lambda^L - \lambda^S)(l - \lambda^L), & \text{if } \Gamma \ge 2. \end{cases}$$

This proves that $r_{\text{opt}}^L > r_{\text{opt}}^S$ for all Γ. The remaining results of this proposition are all straightforward. ■

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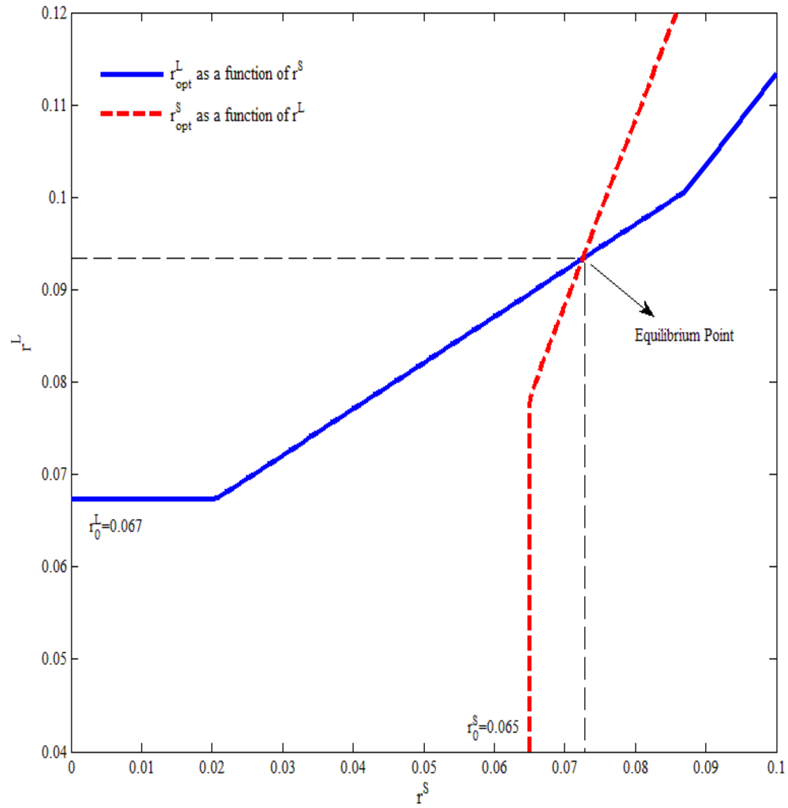
Figure 1: Illustration of Equilibrium Interest Rates.



This figure illustrates the equilibrium interest rates shown in Proposition 1. The solid line depicts the large bank's optimal interest rate r^L_{opt} as a response to the interest rate charged by the small bank, and the dashed line depicts the small bank's optimal interest rate r^S_{opt} as a response to the interest rate charged by the large bank. The intersection of the two lines constitutes the unique equilibrium. Parameters used in this numerical illustration are: $l = 1.0$, $p_1 = 0.8, p_2 = 0.7, \lambda^L = 0.8, \lambda^S = 0.3, \delta = 0.9,$ and $\gamma = 0.4$.

Table 1: Summary Statistics.

This table reports the summary statistics of the variables. The sample consists of 6,345 firm-year observations covered simultaneously by both the CBRC database and the CSMAR database from 2007 to 2012. *BShare* is the financing share of the big five banks, calculated as loans granted by these banks to a firm in one year divided by the sum of the loans granted by all the 17 commercial banks to the firm in the same year. Other variables include: *Cash/Assets*, total cash and equivalents divided by total assets; *EPS*, earnings per share; *EBITDA/Assets*, earnings before interest, taxes, depreciation and amortization divided by total assets; *ROA*, returns on assets; *Leverage*; *Intang/Assets*, intangible assets divided by total assets; *Assets*, total assets; *Age*, the firm's age; *Marketi*, the marketization index indicating the progress of the transition towards the market economy in each province; *Sales Growth*, the growth rate of sales; *Duration*, the length of the firm-bank relationship measured as the average number of months since the firm first borrowed from each big five bank; *No. Banks*, the number of lending banks; *BCapital*, the average of the big five banks' capital adequacy ratio; *BSize*, the average of the big five banks' total assets; and *GDP Growth*, the regional gross domestic product growth. All of the variables are winsorized with limits at 1% and 99%.

Variable	Mean	Std. Dev.	Median	Min	Max
BShare	0.694	0.347	0.811	0.000	1.000
Cash/Assets	0.150	0.145	0.118	0.010	0.677
EPS	0.054	0.645	0.150	-0.795	2.072
EBITDA/Assets	0.029	0.100	0.059	-0.112	0.260
ROA	0.150	0.145	0.118	0.010	0.677
Leverage	0.477	0.193	0.481	0.087	0.998
Intang/Assets	0.074	0.120	0.038	0.000	0.836
Assets (Billion RMB)	3.266	5.987	1.404	0.339	46.460
Age	10.280	5.313	10.000	0.000	28.000
Marketi	9.611	1.982	10.420	0.380	11.800
Sales Growth	0.043	0.303	0.011	-0.253	0.814
Duration (Month)	27.604	17.564	28.000	0.000	51.000
No. Banks	3.187	2.440	2.000	1.000	11.000
BCapital (%)	12.531	0.686	12.306	11.454	13.658
BSize (Billion RMB)	8168.323	2356.275	8159.960	4847.281	12008.023
GDP Growth	0.159	0.050	0.166	0.006	0.323

Table 2: Correlation Matrix.

The table shows the correlation matrix for the variables. The sample consists of 6,345 firm-year observations covered simultaneously by both the CBRC database and the CSMAR database from 2007 to 2012. *BShare* is the financing share of the big five banks, calculated as loans granted by the big five banks to a firm in one year divided by the sum of the loans granted by all the 17 commercial banks to the firm in the same year. Other variables include: *Cash/Assets*, total cash and equivalents divided by total assets; *EPS*, earnings per share; *EBITDA/Assets*, earnings before interest, taxes, depreciation and amortization divided by total assets; *ROA*, the ratio of returns to total assets; *Leverage*; *Intang/Assets*, intangible assets divided by total assets; *Assets*, total assets; *Age*, the firm's age; *Marketi*, the marketization index indicating the progress of the transition towards the market economy in each province; *Sales Growth*, the growth rate of sales; *Duration*, the length of the firm-bank relationship measured as the average number of months since the firm first borrowed from each big five bank; *No. Banks*, the number of lending banks; *BCapital*, the average of the big five banks' capital adequacy ratio; *BSize*, the average of the big five banks' total assets; and *GDP Growth*, the regional gross domestic product growth. All of the variables are winsorized with limits at 1% and 99%.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	BShare	1.00														
2	Cash/Assets	-0.13	1.00													
3	EPS	-0.16	0.59	1.00												
4	EBITDA/Assets	-0.15	0.49	0.89	1.00											
5	ROA	-0.14	0.55	0.79	0.82	1.00										
6	Leverage	-0.13	0.12	0.39	0.44	0.34	1.00									
7	Intang/Assets	-0.08	0.04	0.18	0.25	0.17	0.43	1.00								
8	Log(Assets)	-0.17	0.18	0.55	0.50	0.47	0.59	0.24	1.00							
9	Log(Age)	-0.11	0.12	0.30	0.34	0.29	0.45	0.23	0.39	1.00						
10	Marketi	-0.05	0.00	0.00	-0.01	0.01	-0.04	-0.05	0.00	0.00	1.00					
11	Sales Growth	-0.13	0.17	0.42	0.49	0.50	0.47	0.22	0.44	0.30	-0.04	1.00				
12	Log(Duration)	0.47	-0.04	0.07	0.08	0.02	0.16	0.05	0.20	0.11	-0.02	0.02	1.00			
13	Log(No. Banks)	-0.15	-0.02	0.19	0.22	0.13	0.38	0.15	0.46	0.17	0.05	0.13	0.38	1.00		
14	BCapital	-0.04	0.07	0.14	0.13	0.13	0.09	0.05	0.13	0.07	0.01	0.13	0.07	-0.07	1.00	
15	Log(BSize)	-0.13	0.28	0.34	0.29	0.32	0.10	0.11	0.27	0.26	0.01	0.32	0.13	0.01	0.23	1.00
16	GDP Growth	0.02	-0.02	-0.01	-0.02	-0.05	-0.01	0.01	-0.06	-0.07	-0.24	-0.05	0.05	0.04	-0.30	0.23

Table 3: Comparisons of Large Banks and Small Banks.

This table compares big five banks (large banks) and joint-stock commercial banks (small banks) along several dimensions. To be precise, for the big five banks and the 12 joint-stock banks during the period 2007-2012, the table reports the mean values of annual *Assets* (billion RMB), *State Ownership* (%), *LLP*/ALL (%), the loan loss provisions divided by the total amount of gross loans), *CAR* (%), the total regulatory capital ratio, *CCAR* (%), the core regulatory capital ratio (i.e. Tier-1 capital plus Tier-2 capital), and # Branches, the number of bank branches across the whole country. Yearly observations of these variables are available in the *Bankscope* database and we also cross validate the numbers in each annual reports of 17 commercial banks. *T*-statistics estimated from T test for the mean difference and Z-statistics estimated from Wilcoxon Signed-Ranks test for the median difference are reported separately. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Big Five		Joint Equity					
	Mean	Median	Mean	Median	Mean Diff	*t*-statistics	Median Diff	*z*-statistics
Assets (Billion RMB)	9751.08	9757.65	1359.19	1111.25	8391.89	16.77	8646.40	8.35
State Ownership (%)	59.26	67.66	4.90	0.00	54.36	15.55	67.66	7.62
LLP/ALL (%)	3.26	2.54	2.07	2.05	1.19	3.13	0.50	4.69
CAR (%)	12.71	12.68	11.15	11.08	1.56	4.77	1.60	5.61
CCAR (%)	10.03	10.09	8.47	8.37	1.55	4.73	1.72	5.70
# Branches	13515.71	13457.00	516.37	522.00	12999.34	15.71	12935.00	8.34

Table 4: Bank Type and Loan Granting around the ST Designation.

This table reports the results of loan granting around the ST designation. In China, a listed firm is designated as a special treatment (ST) firm if it encounters a net loss in two consecutive years. The sample consists of 320 observations of ST designations for firms covered simultaneously by both the CBRC database and the CSMAR database from 2007 to 2012. The table presents the results of the OLS regressions relating the change in loan size around the ST designation to the financing share of the big five banks before the ST designation. The dependent variable is the natural logarithm of total loans approved in three or six months after the firm is designated as a ST firm minus the natural logarithm of the total loans approved in three or six months before the firm is designated as a ST firm. The main independent variable is *BShare*, the financing share of the big five banks calculated as loans granted by the big five banks to a firm one year before the ST designation divided by the sum of the loans granted by all the 17 commercial banks to the firm in the same year. Other independent variables include: *Log(Assets)*, the natural logarithm of total assets; Leverage; *Log(Age)*, the natural logarithm of the firm's age; *ROA*, returns on assets; *Log(Duration)*, the natural logarithm of the average duration of the firm's relationships with all big five banks; *Log(No.Banks)*, the natural logarithm of the number of lending banks; *Marketi*, the marketization index indicating the progress of the transition towards the market economy in each province; and *GDP Growth*, the regional gross domestic product growth. Year-fixed effects and industry-fixed effects are included in all regressions. The numbers in parentheses are *t*-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variable	7-month window [-3, 3]			13-month window [-6, 6]		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.177*	0.183**	0.145	-0.102	0.308*	0.283*
	(1.94)	(1.97)	(1.39)	(-1.39)	(1.88)	(1.79)
BShare	0.134**	0.132**	0.133*	0.121*	0.140*	0.142**
	(2.01)	(1.99)	(1.76)	(1.83)	(1.89)	(1.98)
Log(Assets)		0.104**	0.113**		0.183	0.215
		(2.00)	(2.33)		(0.99)	(1.14)
Leverage		-1.498	-1.503		-1.201**	-1.179**
		(-0.96)	(-1.19)		(-1.98)	(1.98)
Log(Age)		-0.232*	-0.240*		-0.109	-0.110
		(-1.65)	(-1.71)		(-0.91)	(-0.84)
ROA		0.172*	0.167*		0.168**	0.164*
		(1.93)	(1.91)		(1.90)	(1.84)
Log(Duration)			0.097*			0.073*
			(1.81)			(1.92)
Log(No.Banks)			0.161*			0.155**
			(1.78)			(1.99)
Marketi	-0.197*	-0.184	-0.192*	0.131	-0.168	-0.167
	(-1.75)	(-1.58)	(-1.68)	(0.83)	(-1.41)	(-1.32)
GDP Growth	-0.073	-0.078	-0.068	-0.101	-0.077	-0.092
	(-0.87)	(-0.95)	(-1.03)	(-0.94)	(-0.72)	(-0.89)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Observations	320	320	247	320	320	247
Adjusted R^2	0.004	0.051	0.055	0.003	0.061	0.062

Table 5: Bank Type and Loan Granting after Loan Default.

This table reports the results of loan granting after default. The sample consists of 1,602 firm-bank observations in default covered simultaneously by both the CBRC database and the CSMAR database from 2007 to 2012. For each firm-bank observation, we assign an indicator variable with value 1 if the firm in default obtains a new loan within six months of defaulting on loans from the bank and 0 otherwise. Panel A reports the results of the portfolio analysis, in which we divide the full sample into two subsamples according to the bank type and compare the percentages of the client firms that obtain new loans after default. Panel B presents the results of the logistic regressions in which the dependent variable is the indicator constructed above. The main independent variable is a dummy indicating whether the bank is big five or not. Other independent variables include: *Log(Assets)*, the natural logarithm of total assets; Leverage; *Log(Age)*, the natural logarithm of the firm's age; *ROA*, returns on assets; *Log(Duration)*, the natural logarithm of the duration of the firm-bank relationship; *Log(No.Banks)*, the natural logarithm of the number of lending banks; *Marketi*, the marketization index indicating the progress of the transition towards the market economy in each province; and *GDP Growth*, the regional gross domestic product growth. Year-fixed effects and industry-fixed effects are included in all regressions. The numbers in parentheses are t-statistics. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Portfolio Analysis.

	Big Five Banks	Joint-Stock Banks	Difference	t-value
Mean	0.437	0.347	0.090***	3.20
Std. Dev.	0.496	0.476	0.492	
Observations	1261	341		

Panel B: Regression Analysis.

Variable	(1)	(2)	(3)
Intercept	-1.278***	-1.431***	-1.218***
	(-3.12)	(-3.96)	(-4.77)
Bank Type	0.628***	0.611***	0.527***
	(6.37)	(6.02)	(5.63)
Log(Assets)		0.185***	0.188***
		(3.50)	(3.41)
Leverage		-0.750***	-0.542***
		(-4.83)	(-3.11)
Log(Age)		-0.028	-0.032
		(-1.58)	(-1.64)
ROA		0.017*	0.015*
		(1.71)	(1.68)
Log(Duration)			0.063**
			(1.96)
Log(No.Banks)			0.119
			(1.16)
Marketi	0.044***	0.043***	0.035*
	(3.12)	(3.04)	(1.88)
GDP Growth	-0.079	-0.086	-0.074
	(-1.28)	(-1.42)	(-1.39)
Year Fixed	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes
Observations	1602	1602	1602
Adjusted R^2	0.083	0.088	0.099

Table 6: Bank Type and Borrowers' Financial Expenses.

This table reports the results of an examination of bank lender type and borrowers' financial expenses. The sample consists of 4,349 firm-year observations without financial difficulties covered simultaneously by both the CBRC database and the CSMAR database from 2007 to 2012. Panel A presents the results of the OLS regressions relating the financial expense to the financing share of the big five banks. The dependent variable is *Log(FinExp)*, the natural logarithm of a firm's financial. The main independent variable is *BShare*, the financing share of the big five banks calculated as loans granted by the big five banks to a firm in one year divided by the sum of the loans granted by all the 17 commercial banks to the firm in the same year. Other independent variables include: *Log(Assets)*, the natural logarithm of total assets; *Leverage*; *Log(Age)*, the natural logarithm of the firm's age; *ROA*, returns on assets; *Log(Payable)*, the natural logarithm of firm payables; *Log(Duration)*, the natural logarithm of the average duration of the firm's relationships with all big five banks; *Log(No.Banks)*, the natural logarithm of the number of lending banks; *Marketi*, the marketization index indicating the progress of the transition towards the market economy in each province; and *GDP Growth*, the regional gross domestic product growth. Year-fixed effects and industry-fixed effects are included in all regressions. Columns (1) to (3) report the regressions based on the full sample. Panel B reports the mean values of various variables for the subsample of firms that borrow exclusively from the join-stock banks and the matched sample constructed by using the propensity score matching algorithm. For each firm-year observation that borrows exclusively from the joint-stock banks, the matching procedure finds a corresponding firm-year observation that minimizes the absolute value of the difference between propensity scores from those borrowing exclusively from the big five banks. The variables used for generating propensity scores include *Industry*, *Year*, *Log(Loans)*, *Log(Assets)*, *Leverage*, and *Log(Payables)*. The numbers in parentheses are t-statistics. Standard errors are adjusted for clustering at the firm level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Regression Analysis.

Variable	(1)	(2)	(3)
Intercept	-3.620***	-5.198***	-5.284***
	(-4.77)	(-8.12)	(-8.18)
Log(Loans)*BShare	0.007*	0.016***	0.015***
	(1.93)	(4.14)	(4.06)
Log(Loans)	0.182***	0.090***	0.079***
	(3.10)	(3.79)	(3.85)
Log(Assets)	0.664***	0.819***	0.841***
	(5.39)	(6.35)	(6.76)
Leverage		2.199***	2.384***
		(6.20)	(6.67)
Log(Age)		0.008*	0.008*
		(1.82)	(1.80)
ROA		-2.036***	-2.027***
		(-6.69)	(-6.49)
Log(Payables)		-0.180***	-0.186***
		(-8.48)	(-10.40)
Log(Duration)			0.003*
			(1.85)
Log(No.Banks)			0.047
			(1.59)
Marketi	-0.019*	0.005	0.003
	(-1.90)	(0.54)	(0.41)
GDP Growth	-0.013*	-0.013*	-0.011*
	(-1.79)	(1.90)	(1.84)
Year Fixed	Yes	Yes	Yes
Industry Fixed	Yes	Yes	Yes
Observations	4349	4349	4349
Adjusted R^2	0.534	0.693	0.698

Panel B: Propensity Score Matching.

	Matched Sample for Big Five Banks	Original Sample for Joint-Stock Banks	Difference	t-value
Log(Asset)	7.082	7.224	-0.142	-0.46
Log(Loans)	2.919	2.874	0.045	0.54
Leverage	0.451	0.440	0.011	0.51
Log(Payable)	2.196	2.115	0.081	0.62
Log(FinExp)	2.424	2.295	0.129*	1.86
Observations	688	688		

Table 7: Determinants of Asymmetric Borrowing: Portfolio Analysis.

This table reports the results of an examination of the determinants of the financing share of the big five banks based on portfolio analysis. The sample consists of 4,349 firm-year observations without financial difficulties covered simultaneously by both the CBRC database and the CSMAR database from 2007 to 2012. The financing share of the big five banks, *BShare*, is calculated as loans granted by the big five banks to a firm in one year divided by the sum of the loans granted by all the 17 commercial banks to the firm in the same year. In all columns except for the last one, we divide the full sample into two equal-sized sub-samples according to various proxies. The proxies for l are *Cash/Assets*, total cash and equivalents divided by total assets; *EPS*, earnings per share; *EBITDA/Assets*, earnings before interest, taxes, depreciation and amortization divided by total assets; *ROA*, the ratio of returns to total assets. The proxies for δ, and γ are firm size (*Assets*); firm *Age*; *Marketi*, the *NERI* marketization index indicating the progress of the transition towards the market economy in each province. For the last column, the proxy for financial crisis is a dummy variable equal to one when the observation occurs during 2008 to 2009, and we use "High" to refer to the crisis period. We compare the mean value of *BShare* for different groups using *t*-tests. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	Proxies for l				Proxies for δ, γ			Proxy for financial crisis
	Cash/Assets	EPS	EBITDA/Assets	ROA	Assets	Age	Marketi	Crisis
Low	0.724	0.719	0.733	0.737	0.748	0.715	0.710	0.684
High	0.641	0.645	0.622	0.652	0.640	0.671	0.682	0.718
Difference	0.083***	0.074***	0.112***	0.085***	0.108***	0.043***	0.028***	-0.035***
t-statistics	9.25	8.28	13.00	9.77	12.53	4.99	3.20	-3.49

Table 8: Determinants of Asymmetric Borrowing: Univariate Regression Analysis.

This table presents the results of the univariate OLS regressions relating the financing share of the big five banks to various firm-levels variables. The sample consists of 4,349 firm-year observations without financial difficulties covered simultaneously by both the CBRC database and the CSMAR database from 2007 to 2012. The financing share of the big five banks, *BShare*, is calculated as loans granted by the big five banks to a firm in one year divided by the sum of the loans granted by all the 17 commercial banks to the firm in the same year. The independent variables include: *Cash/Assets*, total cash and equivalents divided by total assets; *EPS*, earnings per share; *EBITDA/Assets*, earnings before interest, taxes, depreciation and amortization divided by total assets; *ROA*, the ratio of returns to total assets; *Log(Assets)*, the natural logarithm of total assets; *Log(Age)*, the natural logarithm of the firm's age; *Marketi*, the marketization index indicating the progress of the transition towards the market economy in each province; *Crisis*, a dummy variable equal to one when the observation occurs during 2008 to 2009; *GDP Growth*, the regional gross domestic product growth. Year-fixed effects and industry-fixed effects are included in all regressions. The numbers in parentheses are t-statistics. Standard errors are adjusted for clustering at the firm level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.628***	0.579***	0.597***	0.611***	1.509***	0.672***	0.638***	0.635***
	(12.67)	(11.85)	(12.10)	(12.44)	(15.46)	(12.95)	(11.34)	(14.69)
Cash/Assets	-0.214***							
	(-6.91)							
EPS		-0.065***						
		(-9.06)						
EBITDA/Assets			-0.390***					
			(-8.64)					
ROA				-0.786***				
				(-7.32)				
Log(Assets)					-0.043***			
					(-10.76)			
Log(Age)						-0.025***		
						(-3.73)		
Marketi							-0.004**	
							(1.97)	
Crisis								0.045***
								(4.49)
GDP Growth	0.272*	0.314**	0.301**	0.331**	0.353**	0.329**	0.228*	0.282***
	(1.81)	(2.10)	(2.01)	(2.21)	(2.37)	(2.19)	(1.89)	(3.04)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4349	4349	4349	4349	4349	4349	4349	4349
Adjusted R^2	0.057	0.063	0.061	0.064	0.067	0.059	0.051	0.043

Table 9: Determinants of Asymmetric Borrowing: Multivariate Regression Analysis.
This table presents the results of the multivariate OLS regressions relating the financing share of the big five banks to various firm-levels variables. The sample consists of 4,349 firm-year observations without financial difficulties covered simultaneously by both the CBRC database and the CSMAR database from 2007 to 2012. The financing share of the big five banks, *BShare*, is calculated as loans granted by the big five banks to a firm in one year divided by the sum of the loans granted by all the 17 commercial banks to the firm in the same year. The independent variables include: *Cash/Assets*, total cash and equivalents divided by total assets; *EPS*, earnings per share; *EBITDA/Assets*, earnings before interest, taxes, depreciation and amortization divided by total assets; *ROA*, the ratio of returns to total assets; *Log(Assets)*, the natural logarithm of total assets; *Log(Age)*, the natural logarithm of the firm's age; *Marketi*, the marketization index indicating the progress of the transition towards the market economy in each province; *Crisis*, a dummy variable equal to one when the observation occurs during 2008 to 2009; *Leverage*; *Intang/Assets*, intangible assets divided by total assets; *Sales Growth*, the growth rate of sales; *Log(Duration)*, the natural logarithm of the average duration of the firm's relationships with all big five banks; *Log(No.Banks)*, the natural logarithm of number of lending banks; *BCapital*, the average of the big five banks' capital adequacy ratio; *Log(BSize)*, the natural logarithm of the average of the big five banks' total assets; and *GDP Growth*, the regional gross domestic product growth. Year-fixed effects and industry-fixed effects are included in all regressions. The numbers in parentheses are t-statistics. Standard errors are adjusted for clustering at the firm level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.396	0.407	0.420***	0.282***	0.317***	0.439	0.291	0.588***
	(0.68)	(0.71)	(10.72)	(10.48)	(10.54)	(0.75)	(0.49)	(13.98)
Cash/Assets	-0.061**							
	(-1.98)							
EPS		-0.014*						
		(-1.95)						
EBITDA/Assets			-0.103**					
			(-2.01)					
ROA				-0.273***				
				(-2.60)				
Log(Assets)					-0.018**			
					(-2.35)			
Log(Age)						-0.038***		
						(-4.51)		
Marketi							-0.004*	
							(1.88)	
Crisis								0.033***
								(3.54)
Sales Growth	-0.040**	-0.035*	-0.033*	-0.029	-0.029	-0.032*	-0.045**	-0.334***
	(-2.19)	(-1.85)	(-1.71)	(-1.51)	(-1.48)	(-1.71)	(-2.43)	(-2.84)
Log(Duration)	0.150***	0.150***	0.150***	0.149***	0.150***	0.151***	0.149***	0.149***
	(39.97)	(40.01)	(40.00)	(40.01)	(40.08)	(40.39)	(39.94)	(40.01)
Log(No.Banks)	-0.246***	-0.245***	-0.245***	-0.242***	-0.235***	-0.241***	-0.244***	-0.245***
	(-25.60)	(-25.54)	(25.47)	(-25.03)	(-22.04)	(-25.21)	(-25.55)	(-25.67)
BCapital	-0.083***	-0.084***	-0.084***	-0.090***	-0.084***	-0.087***	-0.080***	-0.069***
	(-5.84)	(-5.92)	(-5.93)	(-6.12)	(-5.94)	(-6.17)	(-5.37)	(-4.86)
Log(BSize)	0.117*	0.116*	0.115*	0.137**	0.127*	0.127*	0.128*	0.363***
	(1.72)	(1.71)	(1.69)	(1.98)	(1.87)	(1.88)	(1.86)	(4.80)
GDP Growth	0.156	0.159	0.160	0.168	0.163	0.185	0.081	0.159
	(1.07)	(1.09)	(1.10)	(1.15)	(1.12)	(1.27)	(0.49)	(1.09)
Year Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Industry Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4349	4349	4349	4349	4349	4349	4349	4349
Adjusted R^2	0.407	0.406	0.404	0.406	0.402	0.410	0.405	0.407

Table 10: Financial Crisis (2008-2009) and Asymmetric Borrowing: Regression Analysis.
This table reports the results of an examination of the impacts of the 2008-2009 financial crisis on asymmetric borrowing based on regression analysis. The sample consists of 4,349 firm-year observations without financial difficulties covered simultaneously by both the CBRC database and the CSMAR database from 2007 to 2012. The dependent variable is the financing share of the big five banks *BShare*, calculated as loans granted by the big five banks to a firm in one year divided by the sum of the loans granted by all the 17 commercial banks to the firm in the same year. The main independent variable is a dummy, *Crisis*, indicating whether the observation occurs during the crisis years (2008-2009). Other independent variables includes: *Cash/Assets*, total cash and equivalents divided by total assets; *Leverage*; *Log(Assets)*, the natural logarithm of total assets; *Crisis*, a dummy variable equal to one when the observation occurs during 2008 to 2009; *Leverage*; *Intang/Assets*, intangible assets divided by total assets; *Sales Growth*, the growth rate of sales; *Log(Duration)*, the natural logarithm of the average duration of the firm's relationships with all big five banks; *Log(No.Banks)*, the natural logarithm of number of lending banks; *BCapital*, the average of the big five banks' capital adequacy ratio; *Log(BSize)*, the natural logarithm of the average of the big five banks' total assets; and *GDP Growth*, the regional gross domestic product growth. Year-fixed effects and industry-fixed effects are included in all regressions. Panel A reports the regression results with the cross effects, and Panel B reports the regressions results based on subsamples. The numbers in parentheses are t-statistics. Standard errors are adjusted for clustering at the firm level. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Regressions with Cross Effects.

Variable	(1)	(2)
Intercept	0.528***	0.997***
	(4.69)	(4.45)
Cash/Assets	-0.045*	
	(-1.88)	
Log(Assets)		-0.020*
		(-1.71)
Crisis	0.031**	0.029**
	(2.18)	(2.29)
Cash/Assets*Crisis	0.009**	
	(1.99)	
Log (Assets)*Crisis		0.002***
		(2.61)
Leverage	-0.059*	-0.071***
	(-1.80)	(-2.41)
Intang/Assets	-0.133***	-0.135***
	(-2.69)	(-3.17)
Sales Growth	-0.029**	-0.027**
	(-2.10)	(-1.97)
Log(Duration)	0.155***	0.148***
	(39.35)	(37.16)
Log(No.Banks)	-0.241***	-0.239***
	(-21.43)	(-21.11)
BCapital	-0.079***	-0.074***
	(-5.58)	(-5.13)
Log(BSize)	0.118*	0.128**
	(1.80)	(1.99)
GDP Growth	0.162*	0.168
	(1.77)	(1.34)
Year Fixed	No	No
Industry Fixed	Yes	Yes
Observations	4349	4349
Adjusted R^2	0.401	0.402

Panel B: Regressions Based on Subsamples.

Variable	Cash/Assets		Log(Assets)	
	Non-Crisis	Crisis	Non-Crisis	Crisis
Intercept	-3.726***	1.031	-3.705***	1.012***
	(-3.55)	(1.12)	(-3.54)	(1.10)
Cash/Assets	-0.082*	-0.007		
	(-1.80)	(-0.12)		
Log(Assets)			-0.022***	-0.013**
			(-2.61)	(-2.15)
Leverage	-0.051*	-0.071***	-0.057*	-0.065**
	(-1.75)	(-2.41)	(-1.83)	(-2.35)
Intang/Assets	-0.129*	-0.140**	-0.131**	-0.138***
	(-1.69)	(-2.09)	(-2.26)	(-2.85)
Sales Growth	-0.027	-0.062**	-0.012	-0.051*
	(-0.99)	(-2.37)	(-1.01)	(-1.84)
Log(Duration)	0.145***	0.157***	0.145***	0.157***
	(28.36)	(28.02)	(28.44)	(28.79)
Log(No.Banks)	-0.242***	-0.246***	-0.225***	-0.239***
	(-16.80)	(-18.38)	(-14.61)	(-16.25)
BCapital	-0.097***	-0.068***	-0.091***	-0.073***
	(-5.58)	(-5.42)	(-5.42)	(-5.13)
Log(BSize)	0.455***	0.064*	0.452***	0.061**
	(4.03)	(1.71)	(4.00)	(0.60)
GDP Growth	-0.101*	0.415*	-0.096	0.417**
	(-1.77)	(2.10)	(-0.44)	(2.11)
Year Fixed	No	No	No	No
Industry Fixed	Yes	Yes	Yes	Yes
Observations	3018	1331	3018	1331
Adjusted R^2	0.401	0.399	0.407	0.400