Outsourcing Bank Loan Screening: The Economics of Third-Party Loan Guarantees*

Philip H. Dybvig
Washington University in St. Louis
E-mail: dybvig@wustl.edu

Susan Chenyu Shan
Shanghai Advanced Institute of Finance, SJTU
E-mail: cyshan@saif.sjtu.edu.cn

Dragon Yongjun Tang
The University of Hong Kong
E-mail: yjtang@hku.hk

November 23, 2016

*We thank Franklin Allen, Thorsten Beck, Charles Chang, Maggie Chen, Shaw Chen, Sanker De, Craig Doidge, Qianqian Du, Alex Edmans, Paul Pengjie Gao, Pingyang Gao, Joao F. Gomes, Andrew Hertzberg, Jingzhi Huang, Jeffrey Jarrett, Kose John, Marcin Kacperczyk, Bingxuan Lin, Chen Lin, Tse-Chun Lin, Yue Ma, Asaf Manela, Srikant Marakani, Rujing Meng, David Ng, Henry Oppenheimer, Meijun Qian, Jun Qian, Yiming Qian, Huiyan Qiu, Ehud Ronn, Andrea Schertle, Ivan Shaliastovich, Jing Shao, Ilhyock Shim, Frank M. Song, Laura Solanko, Laura Starks, Wing Suen, Sheridan Titman, Na Wang, Yongxiang Wang, Chenyang Wei, Xueping Wu, Chun Xia, Samuel Xiong, Yan Xu, Fan Yang, Jun Yang, Zhishu Yang, Tong Yu, Chenying Zhang, Hong Zheng, Liu Zheng, Xianming Zhou, and seminar participants at the University of Hong Kong, University of Rhode Island, Wharton, 2011 SIF conference, 2011 TCFA Best Paper Consortium, 2011 IGIDR Emerging Markets Finance Conference, 2012 Hong Kong Institute for Monetary Research China Research Conference, 2012 FMA meetings, 2012 CICF meetings, 2012 WFA meetings, and 2014 Bank of Finland Conference on China's Financial Liberalization for useful comments. We also thank the Wharton Financial Institutions Center and SWUFE Institute of Financial Studies.

Outsourcing Bank Loan Screening: The Economics of Third-Party Loan Guarantees

ABSTRACT

Small and medium-sized businesses in China, just like firms in other countries, face problems in getting bank loans because of information asymmetry and lack of collateral. But China has a unique solution to such financing problem through third-party loan guarantee. Analyzing a sample of loans from a large loan guarantor in China, we find that guarantor's risk measure of the loan is informative about subsequent loan default. Our evidence supports the conjecture that banks outsource part of the loan evaluation to guarantors which specialize in conducting due diligence and detecting fraud. The structure of the guarantees ensures appropriate incentives for both the guarantor and the bank: banks are relatively more concerned about the riskiness of the loan, while guarantors are more concerned about fraud and the quality of collateral. Our outsourcing model generates correct signs to all the coefficients in structural estimations and successfully explains the pricing of the guarantee and loan rate in the data.

I. Introduction

Developed markets often use financial contracting to solve information and incentive problems in bank lending. However, emerging markets may lack such expertise but have other tools. For example, labor is relatively cheap in China and there is a large number of bright engineering students who can help banks to improve bank lending. A recent statistic indicates that approximately one in ten loans in China has a guarantee on it.[1] The OECD (2005) states that collateral and loan guarantees have become an essential precondition for most SME lending in China. In this paper, we use appropriate data to study how banks outsource loan evaluation to a third-party firms with screening technology but without their own funding to make loans.

It is economical for the bank to outsource part of the screening and evaluation function to the guarantor when guarantors have employees with backgrounds that give them a comparative advantage in making on-site visits to detect fraud and screen out applications with less collateral than claimed. We have direct evidence the guarantor is doing valuable work, in the low failure rate of the guaranteed loans, the low percentage of guarantee applications that are accepted, and the usefulness of the guarantor's risk measure in predicting losses from default within the set of accepted loans. The cash flows going to the bank and the guarantor are quite different in a way that gives good incentives to both the bank and the guarantor: the guarantor loses relatively more in the event of outright fraud or deficiency in collateral, while the bank loses relatively more if the riskiness of the project is under-estimated. The incentives built into the loan guarantee contract plays to comparative advantages of the bank and the guarantor.

We formulate, solve, and estimate a formal structural model motivated by the rationale for outsourcing. Our model is based on collateral value and the risk-sharing between the bank and guarantor. We derive expressions for the observable interest rate on the loan and guarantee fee that can be solved in terms of the cost of funds, the amount of collateral, and the guarantor's risk assessment. There are two nested forms of the model, with the richer form including the possibility of "looting" (as in Akerlof and Romer (1993) or Boyd and

[1] See data statistics from China Banking Regulatory Commission (CBRC) for 2013Q2 (retrieved June 26, 2016): http://www.cbrc.gov.cn/chinese/home/docView/3D1E18637ECE44C2BA5EC9E72D7442C0.html. Allen, Qian and Qian (2005) document that for bank lending in China, "fixed assets are the most popular form of collateral, with third-party guarantees being the second-most popular form".

Hakenes (2014)), in which the lender must be concerned about incentives for the borrower to take the money and run instead of using it in the project. The collateral needs to be sufficiently valuable and the project profitable enough for the borrower or else looting would be anticipated and the project would not be funded. Estimation of the structural model cannot reject the simpler model in favor of the more general model with looting: all of the signs of the maximum likelihood estimates are as predicted by the general model but the looting coefficient is insignificantly positive. Our model also predicts correctly the signs of elements of the covariance matrix that are signed unambiguously in the data.

The structural theoretical model is posed in terms of observables to give us testable restrictions in the data. We can think about this as a pricing model, because we can write the testable implication of the model as giving the pricing variables (interest rate charged by the bank and the fee charged by the guarantor) as a function of the other variables and the parameters. The interest rate is equal to a break-even interest rate plus a share of the rents, and similarly the guarantee fee is equal to a break-even guarantee fee plus a share of the rants. The model takes as given the version of the loan guarantee used in practice, and consider which loans are funded as well as the pricing. There is other evidence in support of efficient monitoring by the loan guarantors: the low failure rate compared to the average for bank loans, statements about the role of the guarantor made by market participants we interviewed, the explanatory power of the guarantor's risk measure in predicting failure in our sample, and the comparative expertise of the bank and guarantor employees.

Our sample is restricted to loans made with guarantees, and also includes data on the interest rate charged by the bank, the fee charged by the guarantor, the risk score computed by the guarantor, and the amount of collateral, as well as a number of borrower-specific variables and the Shanghai Interbank Offered Rate (SHIBOR), which we use as banks' costs of funds. One merit of the data is that we can observe guarantee officers' personal traits that may also affect the guarantor's loan evaluation. We document that the guarantor's risk measure is informative in predicting the defaulted amount of loans and the percentage of defaulted amount not covered by collateral. Also, it seems that the current level of fraud in China and the reliability of credit ratings increases the value of site visits to provide independent evaluations of collateral and operations. Indeed, our evidence suggests that hard information such as accounting numbers do not contribute to an effective evaluation of loan risks. Rather, a large part of the predictive power of the guarantor's risk measure comes from soft information collected by the guarantee officer and other unobservables related to the guarantee officer's expertise and experience.

The data have some significant covariances one might expect: the interest rate and the guarantee fee are positively correlated, the guarantee fee and the guarantor's risk measure are positively correlated, and the collateral is negatively correlated with the guarantor's risk measure. Perhaps surprisingly, there is a strong negative covariance between the guarantor's risk measure and the interest rate charged by the bank. In other words, on average the risky loans carry a lower interest rate than the safe loans. One clue to this seemingly strange covariance is that the risk assessment is significantly correlated with the bank's cost of funds, measured by SHIBOR, but not with the loan spread over SHIBOR. This makes sense because in our model an increase in the cost of funds makes the riskiest loans unprofitable so only relatively safe loans will be made and appear in our sample. Put differently, banks only lend to safe projects (whose risk measure is low) when the cost of funds is high. Our model also explains why the loan spread over SHIBOR might not be related to the credit score. In the model, loan spread over the cost of funds is composed of two terms, a required risk premium term giving the excess over the cost of funds that would be required for the bank to break even, and an additional term to give the bank a share of total rents. When the credit score goes down, the required risk premium term increases because the loan is riskier, but the term for the share of profits goes down, and the net effect is ambiguous. The term for the share of profits in the expression for the guarantee fee is not important: according to our estimation, almost all of the variation in rents is absorbed by the bank.

A robustness test explores our observation that our model predicts more sensitivity of the guarantee fee to credit-worthiness than we see in the data, consistent with the guarantor company's statement to us that they have a limited target range (1.5% to 2.5%) for the guarantee fee. We think this policy may be there to mitigate a potential hold-up problem. We can reject our model in favor of an *ad hoc* "excluded variables" extension that provides for this reduced sensitivity. This estimation generally preserves qualitatively the other coefficients, although interestingly it makes the coefficient on looting positive. We are reluctant to read too much into the positive coefficient for looting in this extension, since the *ad hoc* extension of the model may affect the interpretation of the coefficient. Overall, our theoretical structural model for the pricing of the loan and guarantee is not rejected, and all the coefficients in the base model have the correct sign and high significance. Taken together, our results provide strong evidence of the informational role of the loan guarantors. Our finding is consistent with the suggestion of Thakor (1982) that loan guarantors can provide useful monitoring of borrowers, but inconsistent with Thakor's signalling story.[2]

A potential alternative explanation is that the loan guarantees represent a regulatory arbitrage (as suggested by Beck, Klapper, and Mendoza (2010) and Honohan (2010)). By splitting the cost of lending between interest for the bank and the guarantee fee for the guarantor, it might be possible to avoid cap on interest charged by banks – this would be the regulatory arbitrage. However, the data provide strong evidence against this hypothesis. The total of the interest rate plus the guarantee fee is always much less than the interest rate cap. An additional alternative explanation is that there exists an unwritten or implicit regulatory requirement omitted from our model, but the practitioners we interviewed stated that no such requirement exists.[3]

The third-party loan guarantee companies are part of the formal finance system in China as opposed to the informal finance system analyzed by Allen, Carletti, Qian, and Valenzuela (2013). The contracts are offered by firms licensed by the government, at least for the segment of the market we are studying. Our hypothesis that this outsourcing represents cost savings to the bank over in-house analysis is supported by our interviews. Bank loan officers usually have master's degrees in finance from top schools, while employees at the loan guarantee companies usually have degrees in other less-well-paying majors from less prestigious schools.[4] Furthermore, there is anecdotal evidence[5] that banks in China try to improve investors' perception of their efficiency by keeping the number of employees from being too high.

Academic research, both theoretical and empirical, on outsourcing in financial institutions is scarce. Most extant studies are in the context of risk analysis for the purpose of regulation.

[2]The borrowers in Thakor's model signal by choosing how large a guarantee to get. However, in our dataset all guarantees are for 90% of the loan value and the bank will not make a loan without a guarantee. Also, the signalling story seems inconsistent with the low loan acceptance rate of guarantee applications.

[3]We also could not find any other bank regulatory requirement that can be circumvented by using a third-party loan guarantee. For example, using a loan guarantee does not change the principal of the loan, so it does not help to circumvent the 75% cap on loans to deposits ratio in Chinese banks. There also seems to be no reason why using a loan guarantee will relax capital requirements. Banks do not get a lower Basel risk weight for guaranteed loans, according to Chinese bank regulation. Therefore, we conclude that the purpose of loan guarantees is not regulatory arbitrage.

[4]We have also heard claims that the loan guarantee firms have a comparative advantage of collecting value from collateral in the event of a default. This is possible, but outsourcing of the handling of collateral would seem to be of secondary importance given the low default rate in our sample.

[5]from someone who worked on Chinese commercial bank IPOs. ICBC cutting employees from 560,000 to 360,000 before its IPO (https://next.ft.com/content/c1f46ff2-6383-11db-bc82-0000779e2340).

For example, Basel (2005) has an extensive discussion of possible sources of risk to a financial institution that could arise from outsourcing. The report mostly focuses on traditional types of outsourcing (e.g., IT and call centers), which are probably paid for on a fee basis, although it does mention the possible business risk from outsourcing credit assessment and counterparty risk. ECB (2004), section IV, also discusses risks related to outsourcing and gives evidence that during the examined period in Europe there is little outsourcing of a bank's core business such as loan evaluation. Our analysis suggests that outsourcing loan evaluation to a well-capitalized guarantor can reduce risk.

Our paper also extends a growing literature studying information production in bank loan processing including especially those studies on China such as Bailey, Huang and Yang (2011). Previous studies focuses on information production *within* the lending bank (see Hertzberg, Liberti, and Paravisini (2010), Chang, Liao, Yu and Ni (2014), and Qian, Strahan and Yang (2015), among others, for details). Different from all above studies, our paper investigates a new mechanism in which the role of banks in loan evaluation can be *completely* replaced, i.e., delegation of loan evaluation to a third-party loan guarantor.

The rest of this paper is organized as follows: The next section provides the background of loan guarantees in China. Section 3 presents a stylized model. Section 4 introduces our data. Empirical results are discussed in Section 5. Section 6 concludes.

II. Institutional Background: Bank Lending and Loan Guarantees

In the United States, government guarantees of bank loans to companies, such as those offered by the Small Business Administration, are very common as are private second-party guarantees from other parties such as relatives. In contrast, in China, bank loans given to small and medium-sized enterprises often derive from third-party private for-profit loan guarantee companies. In a typical loan guarantee agreement, the borrower pays a fee to the guarantee firm and pledges collateral to the guarantor, and the guarantor guarantees a fraction of the principal of the loan to the bank. Usually, the fraction of principal is between 60% and 100%; in our sample it is always 90%. The first guarantee firm we know of in China was created in 1993 and was owned by the government (as almost all enterprises were at that time). In 2012, 78% of the 8590 guarantee firms were either private enterprises or joint ventures with government.[6]

Our third-party loan guarantees are substantially different from governmental guarantees and guarantees from related parties. As an example of governmental guarantees, the Small Business Administration in the United States guarantees loans to small businesses that might not otherwise be able to borrow. This program is controversial, in part because the default rate is high, and some people argue this is an inefficient way to subsidize small business. By contrast, guaranteed loans in China have a lower default rate than other loans, and even when government has a role (for example, if a local government agency pays part of the guarantee fee), the guarantor has an economic incentive not to guarantee weak projects.

Guarantees by interested parties include guarantees by the borrower's relative or friend, guarantees by the owner of the borrowing company, guarantees by the company's group (such as a Japanese keiretsu), or a guarantee by a company's supplier or customer (such as Apple guaranteeing a loan to a company that sells it keyboards). These guarantees by related parties may be based on superior information or just common interest. By contrast, the guarantees we consider are a transactional business, and the economic interest in the borrower comes from the fees and outflows from the guarantee transaction. Furthermore, any informational advantage they have is from their expertise and information-gathering, not because of a close prior relationship to the borrower.

It is interesting to compare the Chinese third-party guarantees of bank loans to businesses with various other sorts of loan guarantees in the U.S. Individuals borrowing money to buy a house are typically required to pay 1-2% additional interest for mortgage insurance if their down payment is less than 10% of the loan value. Approval of this guarantee is straighforward, and therefore it does not seem to have the informational content of the guarantees we are studying. Freddie Mac and Fannie Mae offer guarantees of portfolios of mortgages they are issuing, and banks often retain some credit risk of loans they securitize. These guarantees are made by sellers of the loans, so it is not a third-party transaction. Guarantees of municipal bond offerings by insurance companies are maybe more similar to the loans we study, since

[6]The number of guarantee firms seems large, but the size distribution is very skewed, with many small, regional firms and only a handful of big players. According to the 2012 statistics by China Banking Regulatory Commission (CBRC), only 54 guarantee firms have registered capital over RMB 1 billion. 4150 guarantors have their registered capital between RMB 100 million to 1 billion. 3673 are between RMB 20 million to 100 million. (http://www.chinafga.org/hysj/20130615/57.html)

the insurance company does a serious risk evaluation before granting a guarantee. However, the institutional structure is much different because the munis are being sold in the open market.

The loan guarantee business in China grew quickly in a time when the Chinese government put heavy emphasis on SME (Small and Medium-sized Enterprise) development. The China Economic and Technological Investment Corporation was established by the Ministry of Finance and the State Economic and Trade Commission in Beijing in 1993. A major push for further market development by the government was made in 1999 after a severe setback of SME development in mid-1990s even in areas such as Jiangsu Province with traditionally strong SMEs, and promoting loan guarantees was one of the initiatives to help SMEs. The loan guarantee industry experienced fast growth in mid-2000s, after the enactment of the law on "Promotion of Small and Medium-sized Enterprises Development" by the National People's Congress in June 2002, under which guarantors would receive a tax deduction.[7] In September 2009, the China Banking Regulatory Commission established a division to oversee the credit guarantee sector, with seven government agencies jointly regulating the loan guarantee industry. So far, the market remains lightly regulated by Chinese standards. According to CBRC, the 2012 year-end outstanding loan guarantee is more than two trillion RMB. There are some illegal unregulated guarantee firms in China; our data from a large well-capitalized registered firm represent more the potential for a well-functioning guarantee firm rather than the potential for disaster for a poorly-capitalized illegitimate firm.

Loan guarantors in China have "feet on the ground" and their employees differ in form and expertise from bank employees involved in lending. While bankers are likely to stay in their offices and spend time on the telephone, the loan guarantors visit the borrowers so they can confirm in person that the firm exists and is not a complete fraud, check the accounting numbers, and evaluate the collateral and the expertise of the borrowers first-hand. Bankers probably have advanced degrees in finance from top schools, while loan guarantors probably have degrees in science or engineering, especially if they specialize in high-tech firms. The guarantors we talked to do a significant amount of work evaluating the loans, and one even

[7]While our analysis focuses on the informational role of loan guarantees, governments at different levels have viewed tax breaks to loan guarantors as a policy tool, and there has been a lot of variation across time, line of business, and location even within a city. It would be interesting to explore this empirically, although getting good data on the tax rules would be difficult. Since the loan guarantee business has thrived with and without these tax breaks, we still view that information gathering is the primary purpose of having loan guarantors.

went so far as to brag that the bank's evaluation is redundant, and that the banks always grant the loans they are willing to guarantee. Guarantors are also smaller than banks in terms of both capital and book assets, making our story consistent with the empirical evidence of Berger, Miller, Petersen, Rajan, and Stein (2005) that small agents are better at collecting soft information and serving smaller borrowers. Given the flexibility and specialty of guarantors, they are expected to have a comparative advantage in detecting outright fraud and going onsite to evaluate the firm's collateral. Banks, however, are good at evaluating business risks and, given the structure of the loan guarantee, care less about collateral.

The next section presents a parsimonious structural model based on institutional features of the market and posed in terms of observables in our dataset. This approach gives us testable implications for our empirical work.

III. Model and Testable Predictions

A potential borrower applies for a loan for a normalized amount 1 to finance a project – the normalization means that the cash amounts in the model can be interpreted as fractions of the loan amount. Once approved by both the guarantor and the bank, the loan is made. Absent fraud or looting (to be discussed later), the borrower undertakes the project. The loan comes due at the end of period (always one year out in our sample) and that is also when the loan's cash flows come. The project fails with probability π, in which case it pays zero, and succeeds with probability $1-\pi$, in which case it pays $\bar{x}$. If the project fails, then the guarantor seizes the collateral, which has value c at the end of the year, and pays the bank a pre-specified guarantee amount g (always 0.9 in our sample).[8] The borrower pays the bank interest in the amount of r and pays the guarantor a fee ϕ. We assume both are paid in arrears (i.e. at the end of the period) to simplify the algebra without a material change in the model. Borrowers differ in the amount of collateral c and the probability π of failure. These amounts are common knowledge in equilibrium for all the agents (borrower, lender, and guarantor) once the guarantor and bank have done their evaluations and communicated with each other.

[8]Often, the owner of the borrowing firm must provide a counter guarantee to the guarantor using personal asset, in which case we should include the owner's assets that can be seized in the collateral c. However, for the entrepreneur of the small firm personal assets are usually inseparable from corporate assets. The counter guarantee serves a purpose against looting.

Our model also includes two possible reasons a project may not be undertaken at all. One possibility, which we refer to as looting (following Ackerlof and Romer (1993) and Boyd and Hakenes (2014)), is that a borrower who has a project chooses not to undertake it and instead runs with the money and forfeits the collateral. Looting does not happen in equilibrium in the model, since it will be anticipated by the lender and guarantor and either the loan will not be made or the interest rate and guarantee fee will be set to make looting unprofitable. We assume looting is worth $k(1-c)$ to the borrower, where k is a positive constant, so that looting is less valuable the more collateral the borrower has to lose. We assume $k \in [0, 1)$ since presumably looting will destroy some value, and if $k = 0$ that is the same as assuming that looting is not possible (or not a concern). Therefore, when the bank and the guarantor share profits, they have to leave rents of at least $k(1-c)$ for the borrower to prevent looting. Another possibility, which we refer to as fraud, is that the applicant does not have any project or collateral at all and plans to take the money without ever repaying it. Part of the job of the guarantor is to screen out fraudulent applicants. We do not model the fraudulent applications or the cost of detecting them, since we do not have detailed data on rejected applications. We do know that only about one-fifth of the applications are accepted and that the default rate on the guaranteed loans in our sample is smaller than the average default rate on bank loans. It is clear that the form of the contract implies that if costs are not too high the guarantor has good incentives for performing the due diligence. We assume that in equilibrium the guarantor is successful at weeding out all the fraudulent applications. This assumption seems like a good approximation given the soft information we have from interviews with market participants and the very low default rate in our data.

First consider the bank's rents from financing the project. Denote the bank's financing cost by r_0 and recall that the loan rate is r. The terminal expected payoff for the bank of making the loan is

$$(1-\pi)[(1+r)-(1+r_0)] + \pi[g-(1+r_0)] = (1-\pi)(r-r_0) + \pi[(g-(1+r_0)]. \tag{1}$$

We will find it useful to define the bank's risk premium ρ_B so that the excess $r - r_0$ of the lending rate over the cost of funds for which the bank breaks even from taking the loan:

$$\rho_B = \frac{\pi(1+r_0-g)}{1-\pi} \tag{2}$$

Next consider the guarantor. If the project is successful, the guarantor will receive the guarantee fee payment in full. If the project fails, the borrower defaults on the loan, the guarantor is obliged to repay the promised fraction g of the loss amount to the bank but receives the collateral from the borrower. Therefore, the expected payoff for the guarantor is:

$$(1-\pi)\phi + \pi(c-g). \tag{3}$$

We define the guarantor's risk premium ρ_G to be the breakeven guarantee fee:

$$\rho_G = \frac{\pi(g-c)}{1-\pi} \tag{4}$$

Finally, consider the borrower. If the project is successful, the borrower collects the proceeds and repays the loan. The collateral will be subsequently returned, and the owner claims all remaining profits. Hence, the expected payoff for the borrower is:

$$(1-\pi)[\bar{x} - (1+r) - \phi] - \pi c. \tag{5}$$

The total rents from making the loan is the sum of the agents' rents, given by

$$(1-\pi)\bar{x} - (1+r_0) \tag{6}$$

Note that the total rents do not depend on c, g, r, or ϕ, since the value of collateral c is the same whether or not the project is undertaken, and the other parameters represent transfers among the three agents. Also, these rents are gross of the bank's and guarantor's costs (unobserved by us) for doing the loan analysis. We are not including these costs in the model on the principle that our model focuses on observables, so we can interpret the rents in our model given that the costs of loan evaluation are already sunk. The rents have to be enough to give the borrower an incentive not to loot the firm. Therefore, the loan will be made whenever total rents exceed the private benefit from looting the firm $k(1-c)$, i.e., the net rents R available to the bank and guarantor after paying the borrower enough to avoid looting is

$$R \equiv (1-\pi)\bar{x} - (1+r_0) - k(1-c) > 0 \tag{7}$$

Note that the decision of whether to grant the loan would be unaffected if we included the evaluation costs explicitly, since the costs are sunk at the time the funding decision is made.

Sharing of the rents among the agents depends on their relative bargaining power and also the costs they face (but we do not observe). We will assume an affine sharing rule for the remaining rents between bank and guarantor, in which the bank has a fraction f_B of the rents and the guarantor has a fraction $f_G = 1 - f_B$, with additional offsetting intercepts, adjusting the guarantee fee by α_ϕ and the interest rate by $-\alpha_\phi$.[9] Simple algebra allows us to compute the guarantee fee and the interest rate charged by the bank:

$$\phi = \frac{\pi(g-c)}{1-\pi} + \alpha_\phi + f_G \frac{(1-\pi)\bar{x} - (1+r_0) - k(1-c)}{1-\pi} \tag{8}$$

$$= \rho_G + \alpha_\phi + f_G \frac{R}{1-\pi}. \tag{9}$$

Therefore, the fee equals the required risk premium plus the fixed part of the share of profits plus the variable part of the share of profits. Similarly, the interest rate (loan rate) charged by bank is:

$$r = r_0 + \frac{\pi(1+r_0-g)}{1-\pi} - \alpha_\phi + f_B \frac{(1-\pi)\bar{x} - (1+r_0) - k(1-c)}{1-\pi} \tag{10}$$

$$= r_0 + \rho_B - \alpha_\phi + f_B \frac{R}{1-\pi} \tag{11}$$

The interest rate equals the cost of funds plus a required risk premium plus the fixed part of the share of profits plus the variable part of the share of profits. While the guarantee contract is not derived as the optimal contract, it is consistent with practice and gives reasonable incentives to both agents, since the guarantor will take a huge hit if the project is fraudulent or if the project is risky and the collateral is bad. The bank will not share so much in the loss if the project is fraudulent or the collateral is bad, but the bank is sensitive to a failure to realize how risky the project is, consistent with the bank's relative expertise in finance.

The firm and guarantor are facing an exogenous cost of funds r_0 and the characteristics π and c of each project, all of which are drawn randomly. We do not have any strong beliefs about the joint distribution of r_0, π, and c, and in particular it is likely that they all depend on time and the state of the market in a complex way that cannot be estimated with any accuracy using data from only four years. In our formal structural estimation, we use maximum likelihood estimator (MLE) to estimate the model predictions of the lending rate r and the guarantee fee ϕ conditional on these draws. This conditional estimation does not involve the joint distribution of the random draws, so it will not matter to us if, for example,

[9] Adjusting the guarantee fee and interest rate by equal amounts in opposite directions preserves the total rents shared by the bank and the guarantor since both are multiplied by the same constant $1-\pi$ in computing rents.

the set of available lending opportunities looks a lot different when interest rates are high than when interest rates are low. We will test model restrictions: $\pi \geq 0$, $\pi \leq 1$, $k \geq 0$, $f_G \geq 0$, and $f_B \geq 0$. We will discuss the formal estimation in a later section, but as a preview none of the restrictions are rejected and in fact the point estimates satisfy all of the restrictions. We do not reject the simpler model without looting (one-sided t for $k > 0$ against the null $k = 0$ has p-value 0.07), and the economic significance of the parameter estimate (.0033) does not seem very great.

Apart from the formal estimation, we also want to discuss the economics in the context of the covariance matrix of all the variables. For this purpose, it is useful to have a theoretical benchmark in which the randomness of r_0, π, and c are known. This is difficult (and unnecessary) to compute analytically, and instead we run a simulation of the model. Our estimation takes as given parameters close to the estimated values and reasonable assumptions about the joint distribution of r_0, π, and c. The output of the simulation is a covariance matrix that can be used to discuss the model and is also available for comparison with the sample covariance matrix.

In the simulation, we start by drawing r_0 uniformly on $[1.5\%, 5\%]$ (to roughly match its mean and variance in the data), and then we draw C uniformly on $[0\%, 80\%]$ (which roughly fits the variance of collateral in the data. The probability of default is drawn uniformly on a range that depends on r_0: $\pi = u - (r_0 - E[r_0]) = u - (r_0 - 3.25\%)$, where u is drawn uniformly on $[3.5\%, 4.5\%]$. This says that projects are safer when r_0 is larger. Other parameters are taken to be rounded versions of the MLE estimates: $k = 0.0033$, $f_B = .982$, and $\overline{x} = 1.095$. The simulation also takes $g = 0.9$ which is the value for all of our data points. The value of α_ϕ does not matter in the simulation, since it does not affect the covariance matrix. The simulated covariance matrix for many variables is given in Table I. Panels A and B have the same parameters except that in Panel B we set $k = 0$ (looting is impossible or always unprofitable). Most of the coefficients in the two Panels are similar, and except where noted, the same effects are dominant in both Panels. The upper left part of the covariance matrix (within the rectangle) gives variables for which we have data or a good proxy.

Consider first the covariances of the contract parameters with the guarantor's risk measure. The covariance between the guarantor's risk measure and the guarantee fee is positive: higher risk implies that a higher fee is charged. It makes sense that this should be the dominant effect in (8), since the guarantor's marginal share of profits f_G is so low.

The covariance of the guarantor's risk premium and the interest rate charged by the bank is negative – the loan with the higher risk has a lower interest rate! One possible channel for this can be seen by examining (10): increasing risk reduces the rents R and almost all of the rents at the margin go to the bank. However, we can see that most of the covariance comes through the bank's cost of funds r_0: the covariance between r_0 and the guarantor's risk measure is of a much larger magnitude than the covariance of the spread $r - r_0$ and the guarantor's risk measure. In fact, if we fixed $\overline{x}$ and the joint distribution of π and C as we varied r_0, increasing r_0 would increase the riskiness and decrease the profitability of the project, which may not be sensible if r_0 is high because the economy is doing well. Our assumption that increasing r_0 implies smaller π on average balances this effect. Theory does not guide us in knowing how project quality depends on the level of r_0, since r_0 is determined in a complex macroeconomic equilibrium that includes government intervention. It is also not possible to estimate reliably the form of the dependence on the macroeconomy from our dataset, because it spans only four years.

Increasing collateral C reduces ϕ by a lot because the risk is smaller and most of ϕ comes from the risk premium (from (8) since f_G is so small). Note that the variance of C is (naturally) large – the same is true in the data – which is why its covariances look so big. Covariance of C with r and r_0 are much smaller. The modest covariance of C with r in Panel A (which comes almost entirely from the spread, not from r_0) is due to the fact that when $k > 0$, if C is too small and r_0 too high, the loan will be rejected for fear of looting. As a result, the conditional expectation of C is higher given large r_0, which is the reason for the positive covariance. There is also a similar channel through the impact of r_0 on π, but that is a smaller effect. There are also similar small effects we could point to throughout the covariance matrix, but we will focus on the main channels with a hope of being estimated significantly.

IV. Data and Sample Description

We use proprietary data from one of the top three third-party loan guarantee firms in terms of market share in China. The data provide information on loan terms such as loan amount, loan rate (interest rate charged by the lending bank), the initial and terminal value of collateral, types of collateral, whether the borrower defaulted on the loan and reason for the default. A key advantage of this data is that it also contains information on how the guarantor collects and uses information on the borrower. The data provides pricing information – guarantee fee and interest rate – and also credit information – the guarantor's risk assessment of the loan as well as information about the borrower. The guarantor's risk measure is a comprehensive measure of borrower credit quality from the guarantor's view. In addition, for each borrower, we observe a "quantitative score" and a "qualitative score", which are internal scores calculated by the guarantor based on borrower's financial data and a subjective analysis by the guarantee officer on borrower's credit worthiness. The two scores are used by guarantee officers to calculate the ultimate risk measure which we term the "guarantor's risk measure". We include one-year Shanghai Inter-Bank Offered Rate (SHIBOR),[10] synchronized to each loan, as a measure of the banks' cost of funds.

Besides loan guarantees, the guarantee firm also engages in other related businesses such as government lending through banks, "entrusted loans" made by the guarantor itself, and direct lending with publicly traded shares as collateral. We only include in the sample loans made by commercial banks that are guaranteed by the guarantor. Starting with data on 1076 loans, we eliminate 212 government loans and 88 entrusted loans,[11] to leave 776 guaranteed loans. We further eliminate loans with missing data on interest rates or guarantee fees, and loans made under special circumstances (e.g. with a direct government subsidy of the guarantee) from the sample. The remaining data contain detailed information on 585 bank loans guaranteed by the guarantor between 2006 and 2009. All sample loans have the same maturity of one year and carry a guarantee equal to 90% of the face value. The borrowing firms are all privately owned. The majority of the borrowers are in manufacturing and most of the rest are in consumer goods and services. For estimation of the structural model, we eliminate five additional observations: three with missing cost-of-funds proxied by SHIBOR (since the loans were made before SHIBOR was originated) and two with missing guarantor risk measure. Our structural estimation uses the remaining guaranteed bank loans.

[10] Shibor works like Libor as a benchmark rate from major Chinese commercial banks as well as China Development Bank, Postal Savings Bank of China, HSBC China, Standard Chartered Bank (China).

[11] For government loans, the interest rate is often zero and the guarantee fee is not the entire compensation for the guarantor. For entrusted loans, there is not guarantee fee separated from the interest rate. Therefore, neither government loans nor entrusted loans have the rich data we have for bank loans.

Borrowers' financial data are self-reported, but reviewed by the guarantor. The guarantee manager documents detailed information about the firm's management. From the notes written by the guarantee manager for each loan, we can also observe the main justifications for approving the guarantee and the potential risks of the firm. The evaluation is based partly on factual accounting information ("hard" information) and partly on subjective judgment ("soft" information). The credit committee's opinion and approval are also documented. We also have information of the personal traits of the guarantee officer who is responsible for the assessment and approval of guarantees, including the officer's gender, age, marital status, working years and education background.

Our dataset includes only loans that are approved by the guarantor and granted by the bank to small and medium-sized enterprises.[12] We observe all the application numbers for approved applications. Judging from the application numbers, we infer that about one-fifth of the applications were approved. Furthermore, market participants told us that almost all the loans approved by the guarantor were made by the bank, so we conclude that the guarantor screens out of most of the applicants.

Panel A of Table II describes the summary statistics of the loan guarantees in our sample year-by-year. The guarantor provided the largest number of guarantees in 2007, with the highest default rate of 3.34%. In total, 11 out of 585 loans defaulted. The guarantor defines default by failure to repay interest for three consecutive months or failure to repay all of the principal at maturity. The aggregate default rate throughout the entire period 2006 to 2009 is 1.88%. The default rate seems to be far below that of government-funded guarantee scheme in other countries documented in literature (see Beck, Klapper and Mendoza (2010)).

The average loan rate in our sample, 7.16%, is comparable to that of Qian, Strahan, and Yang (2015), 6.89%, although the all-in cost to the borrower (including the guarantee fee) is a couple of percent higher. The average collateralization rate, which is the ratio of the collateral value at loan initiation to loan amount, is 74.5% in the raw data. Therefore, many of the loans are not fully collateralized. We truncate the observations with collateralization over 80% down to 80%, as a simple adjustment for the nonlinearity due to overcollateralization, and the numbers in Table II are for the truncated data. We do the same for the structural estimation for consistency. Out of the 585 observations, 162 are trimmed down to 80%. The

[12]Hence we study a sample different from the literature such as Bailey, Huang and Yang (2011). Their sample loans are to publicly listed firms, most likely without guarantees.

average collateralization after truncation is 55.6%.

Panel B of Table II provides summary statistics of risk assessment measures and pricing of our sample guaranteed loans. The main body of the guarantor's risk measure distribution varies from 0.27 (the 5th percentile) to 0.66 (the 95th percentile). A larger guarantor's risk measure represents higher credit risk perceived by the guarantor. The guarantor describes a measure below 0.4 as low risk, 0.4 to 0.6 as medium, and above 0.6 as high. In contrast, the rate of guarantee fee lacks variation both over time and in the cross-section. It centers around 2% for most of the loans with a standard deviation of 0.21%. The mean loan spread, which is calculated as loan rate subtracting the 1-year Shanghai Interbank Offered Rate (SHIBOR), is 3.56%.

Panel C reports the guaranteed loan characteristics. The body of the distribution of loan amounts ranges from 1 million (5th percentile) to 17 million (95th percentile) Chinese Yuan. Collateral value rages from zero to 10.83 million Chinese Yuan, and the trimmed collateralization rate ranges from 0% to 80.00%. The median is 59.58%. Most of the borrowers have less than full collateral. Some of the borrowers do not even pledge any collateral. The low collateralization and the low default rate are strong evidence of the guarantor's ability in evaluating these small loans.

Panel D summarizes borrower characteristics in our sample. Borrowers' total assets vary from 9.02 to 200.03 million Chinese Yuan with a mean of 59.20 million, indicating that our sample is composed of small-and-medium-sized firms. This sample includes start-up firms of 1.6 year-old from its foundation and relatively matured firms of 14 years old. On average, the sample borrowers have annual sales of 91.7 million and 3 shareholders. 62.2% of the firms have obtained credit ratings from a rating agency sponsored by the Bureau of Small and Medium-sized Enterprises set by the local government, 65% have obtained bank loans before, and 47% have been offered guaranteed loans in the past. Firms that are provided with loan guarantee are profitable with average annual return-on-assets of 19%.

V. Empirical Evidence

We present the quantitative empirical evidence for the outsourcing role of loan guarantors as a second level of delegation of monitoring in this section, organized in the following two parts:

I Direct evidence of information production and screening by the guarantor:

(a) the low default rate of guaranteed loans, and the low acceptance rate of loans,

(b) the informativeness of the guarantor's risk assessment in predicting failure in the loans that are made,

(c) the predictability of the soft information part in the guarantor's risk assessment on loan default

II Consistent pricing of the guarantee fee and the lending rate:

(a) structural estimation and failure to reject our pricing model in which collateralization, the guarantor's risk measure and SHIBOR predict the guarantee fee and the interest rate charged by the bank,

(b) Robustness check: an extension motivated by the observation that the variance of guarantee fee in the data seems smaller than predicted in the model. This extension does better than the base model in a Wald test, but the parameter estimates are still consistent with a second level of delegation, since the coefficients in predicting the interest rate and the guarantee fee still have the same signs as predicted by the model.

A. Direct Evidence of Information Production by the Guarantor

According to our hypothesis about outsourcing of monitoring or delegating information production by the guarantor, the guarantor should be producing useful information. We also have soft evidence from our interviews that the rejection of loans is done mostly by the guarantor rather than the bank, and in fact one guarantee manager bragged that the banks always fund the loans he approves. But is this screening beneficial? We have three main pieces of evidence on this: the low default rate in our sample of guaranteed loans, the low loan approval rate in our sample, and the usefulness of the guarantor's risk measure in predicting defaults on the loans that are made.

First, compare the default rates in our sample with all the bank loans in China:[13]

[13] We calculate the average rates of default amount using CBRC statistics of loan default: http://www.cbrc.gov.cn/chinese/home/docViewPage/110009.

		our sample		all China
year	default rate	average loss rate	number of loans	default rate
2006	0.00%	0.00%	29	5.74%
2007	3.34%	2.55%	239	5.15%
2008	1.38%	0.46%	216	3.80%
2009H1	0.00%	0.00%	101	0.99% (whole year)

The default rate of our sample of guaranteed loans is lower in every period, even though our sample is composed of SME loans and most bank loans are to large borrowers. Our default rate is also much lower than the default rate in a different time period for the direct bank loan sample in Qian, Strahan and Yang (2015), even though the borrowing firms are smaller. The average default rate in their sample is 12% in 2004-2006, and it was even higher before the banking reform in China in 2001. Given that our sample spans the 2008 credit crisis, the default rate of our sample loans is rather low and is evidence of a good screening job done by the guarantor.

One may argue that the lower failure rate in our sample may also be due in part to low number of bad loans to SOEs required by government. In our extended sample, none of the loans to SOEs fail. Thus it may be that the bank is obliged to make bad loans but the guarantor is not obliged to guarantee them. We therefore compare the default rate in our sample with that in the direct loan sample constructed by Bailey, Gao, Yang and Zhao (2016). The default rate of loans made to non-SOEs in 2006-2012 is around 1.4% to 1.6%, comparable to the average default rate of 1.88% in our sample, although the size of both borrowers and loans in their sample are much larger: the mean borrower asset is over RMB 2 billion while that of our sample is around 60 million, and all loans in their sample are over RMB 50 million while the 95th percentile of loan amount in our sample is 17 million. Therefore, the low default rate in our sample is not explained by the selection of borrowers.

Second, consider the rejection rate in the sample. We do not observe this directly because our sample includes only accepted loans, but we can build a reasonably good proxy because of the serial numbers on the guarantee applications. Each application has an application number that starts with the year and ends with the serial number giving its count within the year. For example, the last approved application in 2006 has application number 200601188, so this was the 1,188th guarantee application in 2006. Therefore 1188 is a reasonable estimate of the total number of applications during the year (although we know it is probably too low because there were probably a few rejected applications later in 2006). Therefore, dividing the number of acceptances by this denominator will give us a slightly upwardly biased estimate of the acceptance rate, which is conservative since we are arguing the acceptance rate is low implying the guarantor is rejecting most of the applications. The other thing we need to do is to think about what loans to include in the denominator. Since the serial numbers include all loans (including loans to SOEs or with missing data we do not use for most of our statistics), we include all the accepted loans (including the loans to SOEs and loans with missing data) for calculating the approval rates. Using this methodology, we have that most of the applications are rejected:

Application Year	Number Approved	Number of Applications	Acceptance Rate
2006	279	1188	23.48%
2007	374	1818	20.57%
2008	330	1896	17.40%
2009	107	632	16.93%
ALL	1090	5534	19.70%

While we would prefer to have more precise data that matches our sample exactly, we have about 70% of the approved loans in our main sample, so we expect the approval rate is still less than 50% for the population going into in our main sample.[14] Because a lot of applications are rejected by the guarantor and the failure rate for accepted applications is low, we take this as evidence that the guarantor is doing useful monitoring.

As further evidence of value of the guarantor's information, we show that the guarantor's risk measure is useful in predicting loss from defaults within the sample of accepted loans. Specifically, this rules out the argument that the low default rate on these loans is due to some sort of self-selection by the borrower rather than rejection by the guarantor. Table III reports regression results. We construct two measures for loan loss. One is the *Log (1+Amount of Loss)*, where the loss is measured in units of 10,000 yuan. The other is the *Percentage of Uncovered Loss*, calculated as the amount of loss from loan default minus the collateral value, scaled by the total loan amount. Both measures are zero for a loan that does not default. In models 2, 3, 5 and 6, we control for guarantor's private information about the firm and guarantee officers' personal traits. As we can see, *Guarantor's Risk Measure* has positive coefficients for all specifications, suggesting that a larger guarantor's risk measure is

[14] This argument is not ironclad because it could be that all the rejected loans were applications by SOEs and the acceptance rate is 100% for private sector loans in our sample. However, conversations with the guarantor suggest that acceptance rates are not so different across categories of loans.

associated with a larger loss amount from loan default and a larger fraction of uncovered loss.

The results in Table III shows that the guarantor gives reasonable risk assessment of loans in the sense that the risk measure is informative about future loan default, especially the magnitude of default and unsecured part of the loss. Although guarantors and banks are both concerned with default risks, because guarantors share the majority of the loss from loan default, they should care relatively more about the loan performance and the size of the loss. The predictive ability of the guarantor's risk assessment is also consistent with the outsourcing hypothesis and suggests the third-party loan guarantors do have useful information. Section V.B. goes further, showing that the information does not just mimic accounting numbers.

B. Soft Information in Guarantor's Risk Assessment

This subsection provides further documentation of the usefulness of the guarantor's risk measure, by examining its determinants and showing it is not easily explained by accounting variables. This gives some background for interpreting the rest of the results. Consistent with an input of soft information, the "objective" characteristics of the firm only explain 33% of the variation in the risk measure.[15] Note that even it did explain all of the variation, the guarantor might still be making a good contribution by eliminating frauds not in the sample, or more generally by correcting the firm's financials and claimed amount of collateral.

Guarantor's risk measure can be related to other loan and borrower characteristics as guarantors make great efforts in investigating the firm's operation and investment project, thus they should be able to observe the borrower's financial information at least partly. We design regressions to examine how the guarantor's risk measure depends on loan and firm characteristics. These numbers could be related to the default probability in our model, but our model does not provide a full specification of how this works. For our empirical exploration, we estimate the following equation and its alternative forms:

$$\begin{aligned}\text{Guarantor's Risk Measure}_{jt} = \alpha + \gamma_1 \text{Loan Characteristics}_{jt} + \gamma_2 \text{Borrower Characteristics}_{it-1} \\ + \gamma_3 \text{Guarantee Officer Personal Information}_{jt} + \gamma_4 \mu_t + \gamma_5 \lambda_k + \epsilon_{jt} \qquad (12)\end{aligned}$$

where j refers to the loan, i refers to the borrowing firm, k is a vector of borrower industry

[15] Chang, Liao, Yu, and Ni (2014) and Qian, Strahan, and Yang (2015) also document the importance of soft information for China's bank lending.

dummies, and μ is a vector of dummies for the loan contracting year. Loan characteristics include collateralization (the ratio of collateral value to loan amount) and the logarithm of loan amount. Loan maturity does not enter as all loans in our sample have one-year maturity. Borrower characteristics include information observable to both guarantors and banks such as firm size, return-on-assets, leverage, cash-to-total assets ratio, sales growth, asset turnover, firm age, the number of current outstanding loans, whether the firm obtained bank loans before and whether it has a credit rating given by the small-and-medium enterprises (SME) bureau, and information privately owned by the guarantor. Under the "Guarantor's Private Information" category, *Guarantee History* is a dummy variable taking one if the borrower obtained loan guarantees from the same guarantor before. *Political Background* is a dummy taking one if the firm's manager was ever elected to be a representative of National Peoples' Congress of China (NPC).[16] Representatives of NPC are influential or have good connection in the local community. In emerging markets where alternative financing channels are important and often based on reputation and relationships, a firm's financing ability can be influenced by its manager's political background and personal connection. *Relatives Working for the Firm* is a dummy taking one if the firm owner's or manager's relatives work for the firm as well. Such variable may contain information about the firm's management style and corporate governance as firms in which the manager hires her own relatives as employees are more likely to be family firm or with family ownership, and firms with family ownership are different from other firms in corporate governance and financing.

Finally, our data provide individual guarantee officer's personal information, including the officer's working years in the guarantee industry, education background (highest degree received), gender and marital status. Cole, Kanz and Klapper (2015) document that loan officer's personal traits may affect lending decision. By controlling for guarantee officers' personal traits we are able to rule out the possibility that any observed relation between guarantor's risk measure and loan or borrower characteristics is driven by personal characteristics of the guarantee officer who deals with the loan.

Table IV shows that, consistent with our model, collateral could be one determinant of guarantor's risk assessment as the guarantor's risk measure is negatively associated with collateralization. Guarantee contracts allow the guarantor to seize the collateral at the event

[16]Some prior studies such as Khwaja and Mian (2005) and Houston, Jiang, Lin, and Ma (2014) find political connections are important in bank lending.

of loan default. Therefore, a larger collateral value may increase the guarantor's expected payoff and the guarantor may give borrowers with more collateral better guarantee terms. When collateral is insufficient, guarantors would have to use their own capital to cover the loss. Indeed, we find that in 8 out of the 11 default cases in our sample, liquidation of collateral provides enough funding for the guarantor to compensate the loss. Differently put, higher collateralization reduces the possibility that guarantors use their own capital to cover the loss from default. This result is robust to inclusion of other controls.

The negative association between guarantor's risk measure and collateral corroborates the outsourcing hypothesis. As firms that use loan guarantees are usually small and informationally opaque, one crucial task for guarantors is to explore as much private information about the firm. Guarantors do substantial investigation into the firm's operation (as we document in more details in the Appendix A and B) to estimate the risk measure, and the risk measure is kept confidential to the guarantee firms. Based on the signaling models concerning collateral, our results can be interpreted in such a way that the guarantor's risk measure may capture some risks of the loan which are unobservable from the financial statements but tied to the collateral it posts. One of such risks is the liquidation/redeploybility risk of collateral. From a guarantor's perspective, the redeploybility of collateral determines the value and risks of the guarantor's potential asset base. The liquidity/redeployability of collateral is found to be a key factor to determine the role of collateral. More redeployable assets are found to receive larger loans at lower costs (Benmelech, Garmaise and Moskowitz, 2005). In our sample, a majority of the collateral is commercial real estate, which has high redeployability value and is easy to be liquidated by guarantors. Therefore, it makes sense for guarantors to give a lower risk measure when they see higher value of collateral.

Table IV also demonstrates that the guarantor refers to the firm's accounting performance when it assesses the loan risk. Firms with lower cash-to-assets ratio, higher leverage, lower ROA and more outstanding loans in the book are perceived to be riskier by the guarantor. The negative but insignificant coefficients of *Political Background* indicate that the guarantor views borrowing firms with stronger political connection less credit risky.[17]

Guarantors base their loan evaluation on both hard information that can be verified (such as borrowers' accounting variables) and "soft information" they collected via on-site visiting

[17]This finding is consistent with Firth, Lin, Liu, and Wong (2009) who find that political connections help private borrowers to access bank finance in China.

and interviewing firm owner/manager. Such soft information should also include information that helped form the guarantee officer's personal judgement evaluating the loan, therefore, it could be related to the guarantee officer's expertise and experience. Our next question is which component contributes to the predictability of the guarantor's risk measure. We note that in Table III, accounting variables are insignificant in the prediction model of loan default. Does this suggest that the predictability of guarantor's risk measure is mostly from the soft information component? We examine this hypothesis by constructing a soft information proxy. First, we regress guarantor's risk measure on the collateralization rate and a set of accounting variables (including firm assets, ROA, book leverage, asset turnover, sales growth, cash/total assets, firm age, and the number of outstanding loans the firm has at issuance of the guaranteed loan) and a set of variables under the "Guarantor's Private Information" cateogry that are privately observed by the guarantor and can be quantified (including *Guarantee History*, *Political Background* and *Relatives Working for the Firm*); next, we use the residual obtained from the first-stage regression to proxy for the soft information component in the guarantor's risk measure. We use the proxy of soft information in guarantor's risk measure as the independent variable and regress the loan default measures we used before as the dependent variable. Table V shows the estimation results. Models 1 and 4 show that the soft information component has strong predictive power for defaulted amount of our sample loans. Such predictive power remains significant when other explanatory variables, such as guarantor's private information and guarantee officers' personal information, are being controlled for.

The results suggest that third-party loan guarantors rely on soft information to do loan evaluation. Such soft information goes beyond any qualitative and quantitative information that we can read from the dataset. As we document in Appendix A and B, guarantee officers conduct detailed on-site visits and spend time investigating the true quality of the underlying project. Such screening efforts, together with guarantee officer's personal expertise and industry experience, have contributed to the effectiveness of the ultimate risk measure.

C. Covariance among Key Variables and Structural Pricing Model

This section explores and estimates the pricing implications of our structural theoretical model. As a preliminary, we compare the empirical covariance matrix in Table VI with the simulation results in Table I. These covariances help us understand the guarantor's risk assessment and pricing of loans. The covariances in the rectangle are of particular interest because the variables are either observable or well-proxied. Except for ρ_G, the variables in the model are the same as the variables in the data. For the risk measure, we think the guarantor's risk measure should be a very good proxy for ρ_G. Although the two risk measures may have different units of measurement, their covariance with other variables should have the same sign.

Qualitatively, the empirical covariance matrix is close to the simulated covariance matrix. In particular, all of the empirical coefficients that are significantly different from zero have the same sign as the simulated coefficients. The guarantor's fee is positively correlated with the guarantor's risk measure, as we might expect: the guarantor charges a higher fee on risky loans. Perhaps surprisingly, the interest rate charged by the bank is negatively correlated with the guarantor's risk measure. In principle, there could be several possible reasons for this. One is that the guarantor and the bank have very different views of risk, and a loan that is risky to both probably will not be made, and another is that riskier loans tend to be less profitable projects so the lender can charge less of a premium. We have good evidence about what is happening: note that the guarantor's risk measure has a big negative covariance with the bank's cost of funds (SHIBOR) but not significant covariance with the premium of the interest rate over SHIBOR. This suggests that macroeconomic factors are at play, and the banks are making safer loans on average when interest rates are high in the economy, possibly due to scarcity of money to lend. Although statistically significant in our data, the short time period of data and the complexity of the macroeconomy's interaction between fundamentals and policy implies that we should not have any confidence this would hold over a longer time period. The insignificant covariance between the risk measure and the premium on the loan is consistent with offsetting effects in the model: positive covariance between the bank and guarantor's risk premium and negative covariance between the risk premium and the profitability of the loan. Interestingly, the interest rate on the loan and the guarantee fee have positive covariance.

The model gives consistent predictions on how the loan guarantee is evaluated and priced. Panel A of Table I shows that when the looting benefit is small, the rate of guarantee fee ϕ increases in the required risk premium ρ_G, i.e.,the guarantor charges more for providing a guarantee to a more risky borrower. Table VI also presents a positive covariance between the rate of guarantee fee and guarantor's risk measure.

Finally, the fourth row of Table VI also explains how the role of collateral in guarantor's screening of loans. The guarantor's risk measure is negatively related to collteralization, which is consistent with the simulation results in Table I. The negative relation is consistent with the model prediction that collateral evaluation is a key part of guarantor's loan screening. Our interviews with industry people also indicate that loan guarantee officers may have expertise in understanding the firm and the project, therefore, they can do effective screening of collateral quality.[18]

Thus far, we have conducted informal tests of the model by examining the covariance matrix for key variables. Next, we employ the maximum likelihood to estimate the parameters of the model parameters and estimate t-statstics using the Hessian matrix to conduct Wald significance tests. When conducting the estimation, we put one constant, α_ϕ, in the equations for the rate of guarantee fee (ϕ) and loan rate (r) by assuming that the pricing terms are affected by a fixed component, apart from the required risk premium and the share of profits. Now we can interpret the profit-sharing between bank and guarantee firm as having a constant part and a share of the profits. Specifically, we jointly estimate the equations for the rate of guarantee fee (ϕ) and loan rate (r) charged by the bank:

$$\phi_i = f_G \frac{\bar{x}(1-\pi_i) - (1+r_{0i}) - k(1-c_i)}{1-\pi_i} + (g - c_i)\frac{\pi_i}{1-\pi_i} + \alpha_\phi + {\epsilon^\phi}_i \tag{13}$$

$$r_i = r_{0i} + f_B \frac{\bar{x}(1-\pi_i) - (1+r_{0i}) - k(1-c_i)}{1-\pi_i} + (1 + r_{0i} - g)\frac{\pi_i}{1-\pi_i} - \alpha_\phi + {\epsilon^r}_i \tag{14}$$

where i denotes the ith loan. r_{0i} is the bank's funding cost proxied by the one-year SHIBOR on the loan application day.[19] We assume the error terms ${\epsilon^\phi}_i$ and ${\epsilon^r}_i$ follow an independent bivariate normal distribution with mean zero and variances σ^2_ϕ and σ^2_r.[20] Note that ρ_G is the risk premium required by the guarantor, which is unobservable and measured with error. What we can observe is the guarantor's risk measure grm_i. Presumably, ρ_{Gi} should be positively related to grm_i. We assume it to be a linear function of guarantor's risk measure

[18] Our data are not fine enough to separately identify any signalling effects of collateral, as in Berger, Frame, and Ioannidou (2011).

[19] On average it takes about five weeks for the guarantor to approve the loan application. The data do not tell exactly on which day the bank decides on the interest rate to charge. To avoid arbitrarily assigning the date, we extract the SHIBOR for all loans in our sample on the loan application date, which is explicitly and clearly recorded in the data.

[20] We include the error terms in the estimation to allow the possibility that the model could be wrong. This approach also helps avoid the common over-fitting problem in structural model estimations.

grm_i: $\rho_{Gi} = K_0^\star + K^\star grm_i$. If the guarantor's risk measure well reflects the required risk premium then $K^\star$ should be positive. Recall that ρ_G is expressed as $\frac{(g-c)\pi}{1-\pi}$. So the default risk π can be backed out and expressed as a function of grm. The log likelihood function we are maximizing is

$$LL(K_0^\star, K^\star, k, f_B, \bar{X}, \sigma_r^2, \sigma_\phi^2) = -Ilog(2\pi) - \frac{I}{2}\Sigma Log(\sigma^2{}_r\sigma^2{}_\phi) - \frac{1}{2}\Sigma(\frac{\epsilon_{r_i}^2}{\sigma_{r_i}^2} + \frac{\epsilon_{\phi_i}^2}{\sigma_{\phi_i}^2}) \tag{15}$$

where I is the number of loan observations in our sample. Denote the profit from making the loan $\bar{x}(1-\pi_i) - (1+r_{0i}) - k(1-c_i)$ by R_i. The variables satisfy:

$$\epsilon_i^\phi = \phi_i - (1-f_B)\tfrac{R_i}{1-\pi_i} - \rho_{Gi} - \alpha_\phi \tag{16}$$

$$\epsilon_i^r = r_i - r_{0i} - f_B\tfrac{R_i}{1-\pi_i} - \rho_{Bi} + \alpha_\phi \tag{17}$$

$$\tfrac{R_i}{1-\pi_i} = \bar{x} - (1 + r_{0i} + k(1-c_i))(1 + \tfrac{\rho_{Gi}}{g-c_i}) \tag{18}$$

$$\rho_{Bi} = \tfrac{1+r_{0i}-g}{g-c_i}\rho_{Gi} \tag{19}$$

$$\rho_{Gi} = K_0^\star + K^\star grm_i \tag{20}$$

Applying the chain rule we are able to write the gradients with respect to the parameters we are about to estimate. We solve the optimization problem numerically.[21] Parameter estimates and significant test results are reported in Table VII. Consistent with our expectation, $K^\star$ is estimated to be 0.0028, statistically significant at the 1% level. This suggests that the guarantor's risk measure is indeed positively related to the required risk premium implied by the model. The estimate of the constant term $K_0^\star$ is significantly negative. This is fine as we do not have specific requirement on the sign of the intercept. The estimate of k is 0.0033, which is positive and significant at the 10% level, which means our baseline model is rejected and the looting model which introduces the firm manager's incentive to run away with the borrowed money better fits the data. $\bar{X}$ takes the value of 1.095, meaning that the project generates a return of 9.5% in a good state, which seems reasonable. k and $\bar{x}$ altogether

[21] We take two steps to solve the optimization. In the first step, we obtain the optimal values of $K_0^\star$, $K^\star$, k, f_B, and $\bar{X}$ which depend on the relative value σ_r^2/σ_ϕ^2. So, for this optimization, we can just set σ_ϕ^2 to a constant and do a search over σ_r^2. Doing the optimization this way has two advantages: one is that σ_ϕ^2 and σ_r^2 are on a much different scale than the other parameters, which causes problems with the convergence criteria, and the other related problem is that the dependence of the log likelihood on σ_ϕ^2 and σ_r^2 is not approximated well by a quadratic. The second step is to do optimization over σ_r^2. Also, it should be more robust to search for matching σ_r^2/σ_ϕ^2 than for the function, which is bouncing around because the likelihood function is very flat near the optimum.

determine whether the incentive constraint (formula 7) can be satisfied. To avoid looting, the potential payoff in the good state needs to be sufficiently high so that the expected profit from the project is large enough. In the meanwhile, the looting benefit can not be too large. In this regard, the estimates of k and $\bar{x}$ are within a sensible range. Bank share of profit, f_B, is estimated to be 0.982 and significant at 1% level, which is also consistent with our observation from the covariance matrix that the bank takes most of the rents. The constant part α_ϕ is estimated to be 0.0188 with t-value 54.17. The estimate of α_ϕ is large relative to ϕ but small relative to r, which corroborates our observation that the rate of guarantee fee has much smaller variance compared with the loan rate. Estimates of σ_r^2 and σ_ϕ^2 are 1.3×10^{-4} and 4.8×10^{-6}, respectively.

Except for the looting parameter k, the parameter estimates are statistically very significant, which suggests the outsourcing model gives predictions about variable covariances that are consistent with what we observed in the data. The results support the rents-sharing between the lending bank and the borrower and explain the inverse relationship between guarantor's risk measure and the loan rate well. Moreover, the estimation results reject the base model and give insignificant evidence in favor of the model with looting. The guarantor's risk measure is found to be positively related to the required risk premium, which implies that the guarantor's risk measure is a good approximation of the loan risk.

D. Low Sensitivity of the Guarantee Fee to the Risk Measure

In general, the model and sample covariance matrices in Table I and Table VI agree pretty well. One interesting difference is that the variance of the guarantee fee is much less in the data than in the model. This could just be due to an unfortunate choice of parameters in the simulation, but evidence in this section suggests not. In this section, we add another *ad hoc* parameter to the estimation to allow the sensitivity of the guarantee fee to the risk measure to vary, and we reject the null hypothesis that the sensitivity is as high as in our theoretical model, suggesting that our model of risk sharing is too simple. However, the signs and magnitudes of the other parameters are still consistent with our theory, so we do not view this as a fatal flaw.

There are some good economic reasons why the sensitivity of the guarantee fee to the risk measure might be different than what our theoretical model predicts. Our model assumes affine rent sharing between the bank and the manager above the guarantee fee and interest rate that would be required to break even on a loan. Implicitly, this means the guarantee fee reflects all information the guarantor raises about the loan, but it is more likely that the guarantee fee or at least the range of possible guarantee fees is set at the time of application, before the guarantor has much information. This makes sense for avoiding a potential hold-up problem (and/or reputational problem for the guarantor), and is consistent with the statement of a guarantor we interviewed that they limit the guarantee fee to the range from 1.5% to 2.5%. This practice could be related to the regulatory authorities putting limits on the rate of guarantee. This would result in part of the guarantee fee predetermined before risk assessment. Therefore, the guarantor may not do a full risk-based pricing.[22]

The MLE estimation of the structural model subsection V.C was based on (13) and (14). The estimation in this subsection is based on the following equations:

$$\phi_i = f_G \frac{\bar{x}(1-\pi_i) - (1+r_{0i}) - k(1-c_i)}{1-\pi_i} + (1-\kappa)(g-c_i)\frac{\pi_i}{1-\pi_i} + \alpha_\phi + {\epsilon^\phi}_i \tag{21}$$

$$r_i = r_{0i} + f_B \frac{\bar{x}(1-\pi_i) - (1+r_{0i}) - k(1-c_i)}{1-\pi_i} + (1+r_{0i}-g)\frac{\pi_i}{1-\pi_i} - \alpha_\phi + {\epsilon^r}_i \tag{22}$$

The new parameter is κ. These equations are the same as (13) and (14) if $\kappa = 0$.

Estimates for the parameters are given in Table VIII. All parameters are very significant including the new parameter κ, but none of the constraints are binding. The only material difference in the estimates is that the sign of the parameter for looting has become positive and significant. Unfortunately, we do not know whether it is still appropriate to interpret this as a measure of looting when we add the new *ad hoc* parameter to the model. We should also note that the insignificance of looting in the base estimation could be caused by a misspecification of how the guarantee fee is determined. Overall, the results are consistent with the estimates of the main model except for the low sensitivity of the guarantee fee to the risk measure and the new significance of the looting parameter. This is consistent with pricing that committed to at least partially at the time of application, possibly to mitigate a potential hold-up problem.

[22]See announcement from the State Council in November 2006: http://www.gov.cn/zwgk/2006-12/01/content_459533.htm

E. Discussions: Regulatory Arbitrage

Thus far we have shown that our data are consistent with the predictions from the model for outsourcing of loan screening. One alternative explanation is regulatory arbitrage: guarantee provides a way to split lending cost so as to circumvent regulatory cap on interest rate. Put differently, third-party loan guarantees emerge because banks face an interest rate cap which prevents them from lending to risky firms by charging a high interest rate. However, the official interest rate cap for commercial bank lending was removed by the Peoples' Bank of China on October 29, 2004. Therefore, for the sample period we are looking at there is no official interest rate cap. The only possible binding cap is the *legal* upper bound of interest rates for any lending, formal or informal, which is set as four times the base rate. This legal bound was specified in the General Principle of Civil Law in China in 1991 and is still effective.

We plot the total cost of guaranteed loans versus the legal upper bound in Figure 1. Because all guaranteed loans in our sample have the maturity of one year, we calculate the total cost by adding up the loan rate charged by the bank and the rate of guarantee fee charged by the guarantor. It can be seen clearly from Figure 1, during the entire period, the total cost of guaranteed loans is far below the legal upper bound of interest rate for commercial bank lending. This finding rejects the regulatory arbitrage hypothesis which is about explicit interest rate cap.

Apart from this explicit form of regulatory arbitrage, we interviewed loan officers and bank officials to try to recover any implicit or undocumented regulations that might restrict banks from lending directly to these borrowers. The practitioners we interviewed are adamant that there are no regulations that restrict commercial banks from lending to small business without a guarantee. Whether loans are guaranteed is (perhaps surprisingly) not the subject of evaluation by regulators, nor does it enter into the calculation of required capital. In spite of asking about indirect regulation to the point of annoying the people we were interviewing, they insisted there is no regulatory reason to require a loan guarantee.

The industry representatives we contacted say guarantee firms have some advantages in recourse and in dealing with small borrowers in a general sense. At an event of default, commercial banks are not allowed to redeploy collateral without appealing to the court for recourse, while guarantee firms are more flexible and can hold auctions for collateral without obtaining permission from a court. Guarantee firms sometimes take a share of the equity of the distressed borrower, which helps align the interests of the guarantor and the borrower and creates great incentives for-profit guarantors to do an effective screening and monitoring. While these are plausible stories, the low incidence of default in our sample suggests that guarantor's ability to handle default is most secondary to their ability to screen out bad loans.

VI. Conclusion

In this paper, we study both theoretically and empirically third-party loan guarantees. Analyzing a proprietary database from China, we provide evidence of the important informational role played by these guarantors. We find that the risk assessment by the guarantor, especially the soft information component in the risk measure, predicts loan default amount and loss given default. Although those guaranteed loans were made to small business borrowers, their default rate is considerably low. The novel insight of this study is that loan guarantees represent a form of outsourcing of bank loan evaluation, in contrast to the arguments of regulatory arbitrage made elsewhere. This outsourcing is another layer of delegation, from bank to guarantor, like the delegated monitoring from depositors to the banks proposed by Diamond (1984). Due partially to the scarcity of good alternative funding sources for SMEs in China's rapidly growing economy, outsourcing bank loan screening to specialized guarantors with relatively less costly labor and more screening expertise increases the efficiency of bank lending and helps the economy to grow.

Appendix A: Loan Guarantee Cases

In this appendix, we provide two cases for the use of loan guarantees. The information is gathered through interviews with both the borrowing firms' executives and the loan guarantee business managers.

VoxTech – A Telecom Startup

VoxTech was established in early 2000s with initial funding from its three founders. It mainly produces headphones. Its first product was a military headphone and the firm enjoyed some success mostly through OEM (making the products for other brands). In 2011, it started producing a new, self-designed consumer product "AfterShokz" which was distributed through major electronics retailers including AppleStores. However, the product is based on advanced techniques and the firm made great efforts in improving the technology to increase market reception. The firm is recruiting best graduates from the top universities to do core research. The bone-conduction technology is beyond the understanding of the typical bank loan officer, making it difficult to get direct bank loans. Although the firm received several prestigious awards including the *Wall Street Journal* Techonology Innovation Awards (the only winner in the consumer-electronics category in the year), it has little tangible assets to be pledged as collateral. The new business is incurring loss and supported by the previous military product, hence the cash flow of the firm is under pressure.

Lack of direct bank loans, the firm's CEO approached loan guarantee firms for the best financing approach. The guarantee firm manager spent time and effort to understand the technology and business. The CEO of the firm and the guarantee officer share similar education background and have effective communication. The guarantee officer could also understand the potential value of the multiple patents that the company has or is applying for. Eventually the guarantee firm manager is convinced that the business is viable and the firm management is trustworthy. The guarantor helped the firm to obtain a RMB 11 million loan. This loan helped the firm to further improve its product and revenue stream, paving the road for possible VC/PE financing in the next stage. The guarantee firm continued to help the borrower in later years in various ways, such as assisting the firm to apply for government stimulus funds and use an online financing platform. In this way the guarantor can work with many small P2P investors instead of with the bank.

Cestoil – A Chemical Plant

Cestoil Group is a family business based in Shenzhen, Guangdong Province of China. In 2011, the firm started a joint venture with several other partners to build a new chemical plant in Ningbo, Zhejiang Province of China (a major port, about six hundred miles away from Shenzhen). However, the plant took longer to build than planned and cost more than budgeted. By early 2013, there was no more money to continue the project, after the initial investment of more than RMB 100 million. After buying out the shares of other partners of the joint venture, the CEO and Chairman of Cestoil Group talked to banks in Shenzhen, especially its relationship bank, Bank of China Shenzhen branch, to apply for a loan to finish the project in Ningbo. However, the bank could not understand the business prospect of the chemical plant and refused to lend. Then the CEO was introduced to a loan guarantee officer at the guarantee firm. The gurantee officer has an engineering background and made several site visits to the plant under construction. He explained to the bank risk manager the business model. The guarantee officer believes that the project after completion is very promising. Even if the project fails, Cestoil's existing business in Shenzhen will be able to generate enough money in about five years to repay the loan. Hence, the guarantee officer convinced his colleagues at the guarantee firm and the bank business manager as well as bank risk manager to provide a loan of RMB 25 million to Cestoil. The loan was successfully repaid by the due date and the company has grown rapidly ever since.

Appendix B: Typical Arrangement for Loan Guarantees

In this section, we illustrate some key features of the guarantee arrangements. The information is provided by bankers from, among others, Bank of China and Shanghai Bank, and loan guarantee officers.

- *How do banks view guarantors' risk assessments?* Guarantors have their own risk assessment model independent of that of banks. Their risk assessment is not necessarily worse than banks, because guarantee officers (especially those working for privately-owned guarantors) have strong incentives to screen out bad loans and monitor the borrowers.
- *How long does it take to approve a guaranteed loan?* Fast processing of loan application is important for small borrowers as their opportunities change rapidly and their liquidity

demand can be unpredictable and high. Direct bank loans take many months to approve. The fastest banks may take one or two months but the slow banks (e.g., Agricultural Bank of China) may take six to eight months to approve loans to small and medium-sized borrowers. One claimed advantage of guaranteed loans is the speedy processing. Some cases can be completed within weeks. Guarantee firms with market power can also pick fast banks to work with or nudge the banks to process faster. They may interact with multiple banks and get the fastest banks with the best pricing.

- *How do guarantors and banks share the loss?* Usually, guarantors have to cover a majority of the loss amount from defaulted loans as guarantors have smaller bargaining power relative to banks. Guarantors sometimes have to repay 100% of the loss. Only large state-owned guarantee firms can bargain with the bank and provide a partial guarantee. A typical sharing rule of the loss repayment between guarantor and bank is 85%:15% (in Chengdu area).

- *Do loan officers find third-party loan guarantees helpful?* Loan officers want to work with a third-party loan guarantee because loan officers get punished if the loan they approved defaults. Loans are classified into five categories by riskiness: good, normal, problematic, risky and defaulted. Loans in the last three categories are regarded as bad loans. Loan officers and even their managers get punishment for the problem loans. Loan officers may lose their job if the loan they approved defaults. The punitive measures are determined by individual banks, and banks follow some general guideline set by the central regulator to make the rule. Because of this, loan officers are reluctant to approve risky loans, if even they can charge a high spread from it. If the loss can be covered by guarantee or collateral, the default will not appear on bank's book as a loss, and the loan officer can be disclaimed. The guarantee officer believes the critical issue in SME lending is the lack of collateral, and guarantees emerge to tackle this problem. However, for small borrowers who can pledge collateral of greater value than loan amount, banks do provide additional credit products to them with better terms, as one way to encourage small firms to borrow from banks.

- *How different are guarantors and banks in dealing with collateral?* Guarantee firms are more flexible in a recourse. If a firm defaults, the guarantor may negotiate with the firm to get control over collateral and hold an auction, from which they may make profits. In the case of direct bank loans, if banks seize the collateral, they are not allowed to hold an auction for the collateral by themselves without approval from the court, and the process is tedious and costly. One reason for this is that commercial banks by law are not allowed to invest in real estate, which is regarded as the business of investment banks. In contrast, guarantee officers deal with collateral with more freedom. They also try much harder to push the firm for payments (even use violence sometimes, which is illegal and rarely happens for banks).

- *Is there any law or regulation that requires SMEs to get guarantees before obtaining a bank loan?* No. Both large (but probably not very large such as state-owned enterprises) and small firms could be required by the bank to find a guarantee before applying for a loan. If a small firm has sufficient assets to pledge as collateral, the bank may not need to ask for a guarantor. Banks may treat guarantee and collateral as substitutes. Banks demand guarantee or collateral based on their risk assessment of the firm. The guarantor selected by the borrower or bank branch needs to be approved by the headquarter office.

- *What are the different types of loan guarantee firms?* While the majority of loan guarantee firms are privately owned, others are initiated and controlled by the central or local municipal government. One advantage of government-controlled guarantee firm is that it is relatively easier to find potential borrowers. They can obtain a list of borrowers and the borrowers' credit history from banks. Banks sometimes have done a preliminary screening of the firms. On the guarantor side, the risk assessment procedure is similar to that in a privately-owned one. The guarantee officers investigate each borrower and write a report for each loan. The guarantee officers keep the report to themselves and disclose the guarantee fee only to banks. Take one government-controlled guarantee firm located in Zhejiang as an example, the rate of guarantee fee is often between 1.8% to 3%. Before 2011, the guarantor is required to cover 70% of the loss and the bank covers 30%. After 2011, the proportion is changed to 60% and 40%. During the investigation, guarantee officers examine borrowers' accounting information, including revenue, account receivables, payables and bank statement. They also check whether the firm involved in any illegal acts (i.e., gambling, etc) before.

- *Do guarantee officers do a good job in screening the loan applications?* One loan guarantee officer we interviewed has guaranteed hundreds of loans and only two of the borrowers defaulted. The borrower in one default case was found to be involved in fraud as it has multiple borrowing records but never repays any.

References

Ai, Jing, Warren Bailey, Haoyu Gao, Xiaoguang Yang, and Lin Zhao, 2016, Corporate default with Chinese characteristics, Working paper, Cornell University, University of Hawai'i at Manoa, and Chinese Academy of Sciences.

Akerlof, George, and Paul Romer, 1993, Looting: The economic underworld of bankruptcy for profit, *Brookings Papers on Economic Activity* 2, 1-73.

Allen, Franklin, Elena Carletti, Jun Qian, and Patricio Valenzuela, 2013, Financial intermediation, the credit markets, and alternative financial systems, *Handbook of the Economics of Finance*, Elsevier, Vol. 2A.

Allen, Franklin, Jun Qian, and Meijun Qian, 2005, Law, finance, and economic growth in China, *Journal of Financial Economics* 77, 57-116.

Bailey, Warren, Wei Huang, and Zhishu Yang, 2011, Bank loans with Chinese characteristics: Some evidence on inside debt in a state-controlled banking system, *Journal of Financial and Quantitative Analysis* 46, 1795-1830.

Basel Committee on Banking Supervision (Basel), 2005, Outsourcing in financial services, http://www.bis.org/press/p050215.htm

Beck, Thorsten, Leora F. Klapper, and Juan Carlos Mendoza, 2010, The typology of partial credit guarantee funds around the world, *Journal of Financial Stability* 6, 10-25.

Benmelech, Efraim, Mark J. Garmaise, and Tobias J. Moskowitz, 2005, Do liquidation values affect financial contracts? Evidence from commercial loan contracts and zoning regulation, *Quarterly Journal of Economics*, 120, 1121-1154.

Berger, Allen N., W. Scott Frame, and Vasso Ioannidou, 2011, Tests of ex-ante versus ex-post theories of collateral using private and public information, *Journal of Financial Economics* 100, 85-97.

Berger, Allen N., Nathan H. Miller, Mitchell A. Petersen, Raghuram G. Rajan, and Jeremy C. Stein, 2005, Does function follow organizational form? Evidence from the lending practices of large and small banks, *Journal of Financial Economics* 76, 237-269.

Boyd, John H, and Hendrik Hakenes, 2014, Looting and risk shifting in banking crises, *Journal of Economic Theory* 149, 43–64.

Chang, Chun, Guanmin Liao, Xiaoyun Yu, and Zheng Ni, 2014, Information from relationship lending: Evidence from loan default in China, *Journal of Money, Credit, and Banking* 46, 1225-1257.

Cole, Shawn, Martin Kanz, and Leora Klapper, 2015, Incentivizing calculated risk-taking: Evidence from an experiment with commercial bank loan officers, *Journal of Finance* 70, 537-575.

Diamond, Douglas W., 1984, Financial intermediation and delegated monitoring, *Review of Economic Studies* 51, 393-414.

European Central Bank (ECB), 2004, Report on EU Banking Structure, November 2004.

Firth, Michael, Chen Lin, Ping Liu, and Sonia M.L. Wong, 2009, Inside the black box: Bank credit allocation in China's private sector, *Journal of Banking & Finance* 33, 1144-1155.

Honohan, Patrick, 2010, Partial credit guarantees: Principles and practice, *Journal of Financial Stability* 6, 1-9.

Houston, Joel, Liangliang Jiang, Chen Lin, and Yue Ma, 2014, Political connections and the cost of bank loans, *Journal of Accounting Research* 52, 193-243.

Khwaja, Asim, and Atif Mian, 2005, Do lenders favor politically connected firms? Rent provision in an emerging financial market, *Quarterly Journal of Economics* 120, 1371-1411.

Qian, Jun, Philip E. Strahan, and Zhishu Yang, 2015, The impact of organizational and incentive structures on soft information: Evidence from bank lending, *Journal of Finance* 70, 1457-1493.

Shim, Ilhyock, 2006, Corporate credit guarantees in Asia, *BIS Quarterly Review*.

Thakor, Anjan, 1982, An Exploration of Competitive Signalling Equilibria with "Third Party" Information Production: The Case of Debt Insurance, *Journal of Finance* 37, 717-739.

Figure 1. Total Costs of Guaranteed Loans and Interest Rate Cap

This figures plots the total financing cost of third-party guaranteed loans and the contemporaneous one-year interest rate cap (the y-axis is in percentage). All guaranteed loans have the same maturity of one year. The total cost of guaranteed loans is the sum of the rate of guarantee fee charged by the third-party loan guarantor and the interest rate charged by the lending bank. The interest rate cap is four times the base rate set by the Peoples' Bank of China. Our sample guaranteed loans span four years from 2006 to 2009H1.

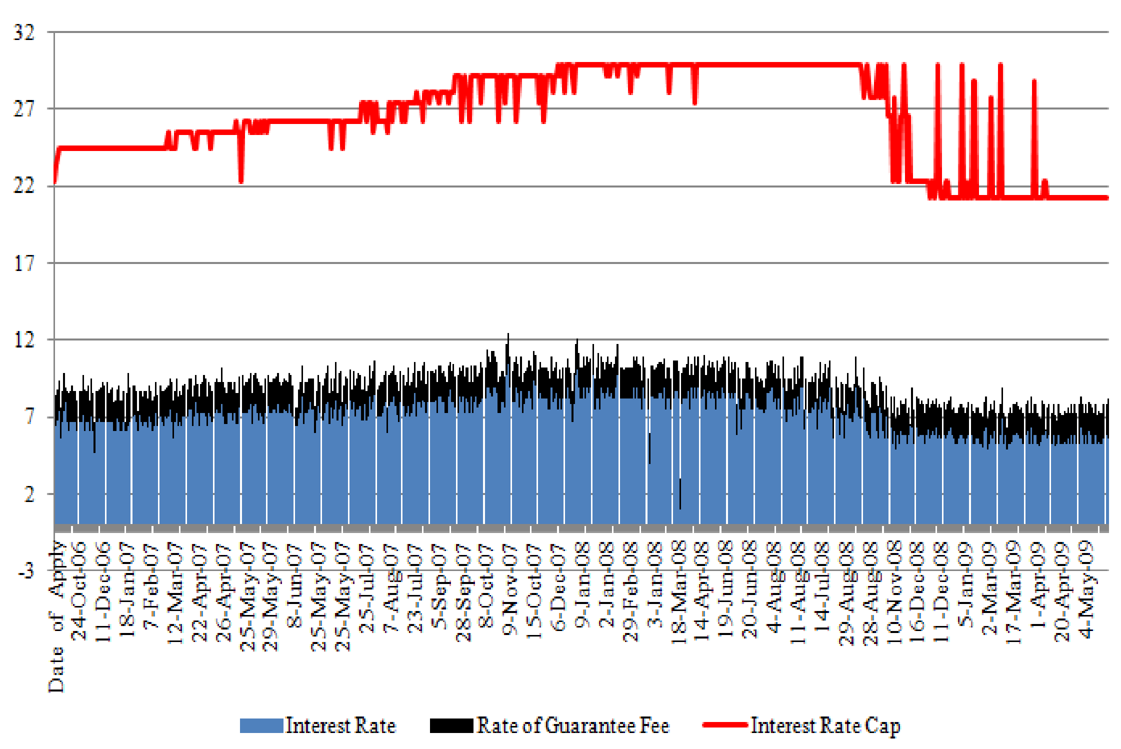

Table I
Simulated Covariance Matrix

This table reports the covariances of key variables from simulation. Each Panel reports a simulation with 1,000,000 random draws, and the two Panels differ only in whether looting is possible ($k = 0.0033$) or not ($k = 0$). The choice of parameter values are roughly calibrated to parameters in the data or in the MLE estimation. r denotes the loan rate; ϕ denotes the rate of guarantee fee; ρ_G denotes the guarantor's credit risk measure for the loan (larger value representing higher risk perceived by the guarantor); c is the collateralization rate, calculated as the ratio of collateral value relative to loan amount; r_0 is the bank's cost of fund measured by the 1-year Shanghai Interbank Offered Rate (SHIBOR); ρ_B denotes bank's required risk premium (or risk measure) of the loan (larger value representing higher risk perceived by the bank); π is the borrower's default risk; $Profit$ refers to the total profit shared by guarantor and bank from making the loan, calculated as $\bar{x}(1-\pi)-(1+r_0)-k(1-c)$. π is assumed to equal $u-(r_0-\text{mean}(r_0))$, where u is drawn uniformly on $[3.5\%, 4.5\%]$. c is drawn randomly from uniform distribution between 0 and 0.8. r_0 is drawn from uniform distribution on [0.015,0.05]. The values for π, c and r_0 satisfy $(1)\bar{x}(1-\pi)-(1+r_0) > k(1-c)$; $(2)c < g$. k is assumed to be a constant. f_B and $\bar{X}$ take the value of 0.982 and 1.095, respectively. All variable values are expressed as percentages.

Panel A. Covariance Matrix When k=0.0033

	r	ϕ	ρ_G	c	r_0	$r-r_0$	ρ_B	π	Profit
r	1.058								
ϕ	-0.656	1.333							
ρ_G	-0.659	1.336	1.340						
c	1.750	-22.419	-22.455	533.723					
r_0	0.998	-0.550	-0.552	-0.046	1.020				
$r-r_0$	0.060	-0.105	-0.107	1.796	-0.022	0.083			
ρ_B	-0.112	0.062	0.062	0.005	-0.103	-0.009	0.012		
π	-1.078	0.594	0.597	0.049	-1.020	-0.057	0.115	1.104	
Profit	0.188	-0.173	-0.176	1.753	0.097	0.091	-0.023	-0.188	0.115

Panel B. Covariance Matrix When k=0

	r	ϕ	ρ_G	c	r_0	$r-r_0$	ρ_B	π	Profit
r	1.047								
ϕ	-0.582	1.340							
ρ_G	-0.585	1.342	1.344						
c	0.030	-22.509	-22.509	533.959					
r_0	0.995	-0.554	-0.555	0.023	1.020				
$r-r_0$	0.052	-0.028	-0.030	0.008	-0.025	0.076			
ρ_B	-0.113	0.063	0.063	-0.004	-0.104	-0.009	0.012		
π	-1.075	0.597	0.601	-0.032	-1.020	-0.055	0.116	1.104	
Profit	0.187	-0.103	-0.106	0.012	0.102	0.085	-0.024	-0.194	0.111

Table II
Summary Statistics

This table reports the summary statistics of our sample guaranteed loans. Panel A presents summary statistics of loan characteristics by guarantee application year. Columns 4 to 8 report the mean of the variables that descibe loan charactersitics. *Guarantor's Risk Measure* is the guarantor's comprehensive assessment of the loan risk, ranging from 0 to 1. Larger values represent higher loan risk perceived by the guarantor. *Rate of Guarantee Fee* is the upfront fee charged by the guarantor, reported as a percentage of the loan amount. *Loan Rate* is the interest rate charged by lending banks. *Collateralization* is the ratio of the value of collateral at loan initiation relative to loan amount. Values of collateralization larger than 80% are truncated at 80%. *Default Rate* is the ratio of the number of defaulted loans out of total loans. Observations with missing data on the rate of guarantee fee or loan rate are excluded from the sample. Panel B reports the summary statistics of the risk assessment and pricing measures of the loans given by the guarantor and the bank. *Quantitative Score* and *Qualitative Score* are the two intermediate scores used to calculated the final *Guarantor's Risk Measure*. *Quantitative Score* is calculated from the firm's accounting variables; *Qualitative Score* reflects the officer's subjective judgment on the firm's credit worthiness, based on the firm's market share, industry condition and managerial ability. Larger scores represent better quality from the guarantee officer's point of view. *SHIBOR* is the 1-year Shanghai Interbank Offered Rate on the day of loan application. *Loan Spread* referes to loan rate subtracting contemporaneous SHIBOR. Panel C presents the summary statistics of variables that describe the sample loan characteristics. Panel D presents the summary statistics of variables that describe the borrower characteristics. *Leverage* is the ratio of book debt over book assets. *ROA* is the ratio of EBIT over book assets measured on annual basis. *Asset Turnover* is the ratio of revenue over total assets. *Rated by SME Bureau* is a dummy taking one if the borrower has obtained a credit rating from the SME Bureau before loan origination. *Previous Loan* is a dummy taking one if the borrower has obtained a bank loan before. *Guarantee History* is a dummy taking one if the borrower was guaranteed by the same guarantor before. *Number of Current Loans* is the number of outstanding loans the borrower has on its book at initiation of the guaranteed loan. *Relatives Working for the Firm* is a dummy taking one if relatives of the firm manager also work for the firm at the time of loan initiation. *Political Background* is a dummy taking one if the firm's manager was ever elected to be a member of the National Peoples' Congress of China.

Panel A. Summary Statistics by Year

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year	# of Loans	# of Loan Defaults	Guarantor's Risk Measure	Rate of Guarantee Fee (%)	Loan Rate (%)	Loan Amount (RMB 10,000)	Collater -alization	Default Rate
2006	29	0	0.557	2.11	6.63	311.03	56.63%	0.00%
2007	239	8	0.465	2.04	7.43	549.66	53.10%	3.34%
2008	216	3	0.429	2.01	7.66	541.63	57.54%	1.38%
2009H1	101	0	0.449	1.97	5.62	480.79	57.09%	0.00%
Total	585	11	0.454	2.02	7.16	522.97	55.60%	1.88%

Panel B. Risk Assessment and Pricing of the Guaranteed Loans

Variable	Mean	5th Percentile	Median	95th Percentile	StDev
Guarantor's Risk Measure	0.45	0.27	0.44	0.66	0.12
Rate of Guarantee Fee (%)	2.02	1.8	2	2.5	0.21
Quantitative Score (0-100)	49.08	32	49	62	20.75
Qualitative Score (0-30)	20.23	15	20	23	9.01
Loan Rate (%)	7.16	5.31	7.22	8.96	1.14
Loan Spread (Loan Rate - SHIBOR, %)	3.56	2.31	3.60	4.47	0.70

Panel C. Loan Characteristics

Variable	Mean	5th Percentile	Median	95th Percentile	StDev
Loan Amount (RMB 10,000)	522.97	100	300	1700	644.81
Collateral Value at Loan Origination (RMB 10,000)	353.01	0	137	1,083	1,063.94
Collateralization	55.60%	0.00%	59.58%	80.00%	24.42%

Panel D. Borrower Characteristics

Variable	Mean	5th Percentile	Median	95th Percentile	StDev
Total Assets (RMB 10,000)	5,919.88	902.96	3,644.00	20,003.00	6,707.80
Sales (RMB 10,000)	9,166.26	1,144.84	5,196.30	29,981.00	13,459.01
Leverage	0.34	0.09	0.34	0.63	0.16
ROA	0.19	0.05	0.17	0.42	0.13
Cash/Total Assets	0.08	0.01	0.05	0.21	0.07
Asset Turnover	1.74	0.49	1.44	4.56	1.30
Firm Age (Years)	7.00	1.58	6.19	14.01	3.93
Sales Growth	−0.07	−2.70	−0.05	2.26	1.53
Number of Shareholders	3.00	1.00	2.00	7.00	6.31
Registered Capital (RMB 10,000)	1,419.84	50.00	600.00	5,000.00	2,706.67
Rated by SME Bureau	0.62	0.00	1.00	1.00	0.48
Previous Loan	0.65	0.00	1.00	1.00	0.47
Guarantee History	0.47	0.00	0.00	1.00	0.49
Number of Current Loans	2.54	0.00	2.00	8.00	4.02
Relatives Working for the Firm	0.39	0.00	0.00	1.00	0.48
Political Background	0.27	0.00	0.00	1.00	0.44

Table III
Predictability of Guarantor's Risk Measure on Loan Default

This table presents the estimates of regressions that examine the predictability of guarantor's risk measure on the defaulted loan amount. The dependent variables are (1) the natural logarithm of the loss amount from loan default; (2) the percentage of loss not covered by collateral, calculated as the amount of loss minus collateral value, scaled by the total amount of loan. The independent variable of interest is *Guarantor's Risk Measure*, which ranges from 0 to 1 and a Larger guarantor's risk measure represents higher loan risk perceived by the guarantor. Controls include: *Collateralization*, the ratio of collateral value relative to loan amount; "Firm Characteristics", including log (total assets), ROA, sales growth, asset turnover, cash/total assets, book leverage, log (firm age), and the logarithm of the number of outstanding loans at the issuance of the guaranteed loan (*Log (1+ # of Current Loans)*). "Guarantor's Private Information" refers to information about the borrower that is collected and observed by the guarantor only. *Guarantee History* is a dummy taking one if the borrower ever obtained loan guarantees from the same guarantor before. *Political Background* is a dummy taking one if the firm's manager was ever elected to be the representative of the Peoples' Congress of China. *Relatives Working for the Firm* is a dummy taking one if the firm manager's relatives also work for the firm. "Guarantee Officer's Personal Information" includes the guarantee officer's age (*Age*), gender (*Female*), marital status (*Married*), education background (*Master Degree or Above*), and the number of working years in the guarantee industry (*Working Years*). Observations with missing loan rate or guarantor's risk measure are excluded from the sample. We control for loan origination year, borrower industry and lending bank fixed effects in all specifications. The standard errors corrected for heteroskedasticity are reported in parentheses. ***, **, and * denote statistical significant at the 1%, 5%, and 10% level, respectively. See Table II for detailed variable definitions.

	Log (1+Amount of Loss)			Percentage of Uncovered Loss		
Variable	Model1	Model2	Model3	Model4	Model5	Model6
Guarantor's Risk Measure	0.478**	0.478**	0.473**	1.535***	0.904***	0.937***
	(0.216)	(0.229)	(0.239)	(0.331)	(0.314)	(0.325)
Collateralization	.	0.001	0.001	.	-0.018***	-0.018***
	.	(0.001)	(0.001)	.	(0.002)	(0.002)
Firm Characteristics						
Log (Total Assets)	.	-0.051	-0.054	.	-0.074	-0.083
	.	(0.051)	(0.052)	.	(0.070)	(0.071)
ROA	.	0.029	-0.048	.	-0.219	-0.294
	.	(0.274)	(0.280)	.	(0.376)	(0.382)
Sales Growth	.	0.024	0.025	.	0.02	0.03
	.	(0.026)	(0.027)	.	(0.036)	(0.037)
Asset Turnover	.	-0.014	-0.024	.	0.033	0.031
	.	(0.030)	(0.031)	.	(0.041)	(0.042)
Cash/Total Assets	.	0.633	0.604	.	0.329	0.381
	.	(0.454)	(0.466)	.	(0.623)	(0.635)
Leverage	.	0.024	0.019	.	0.083	0.103
	.	(0.217)	(0.225)	.	(0.298)	(0.308)
Log (Firm Age)	.	-0.046	-0.047	.	0.006	0.008
	.	(0.034)	(0.035)	.	(0.047)	(0.048)
Log (1+ # of Current Loans)	.	0.045	0.027	.	-0.083	-0.073
	.	(0.040)	(0.043)	.	(0.055)	(0.059)
Guarantor's Private Information						
Guarantee History	.	.	-0.085	.	.	-0.043
	.	.	(0.061)	.	.	(0.083)
Political Background	.	.	0.113*	.	.	0.094
	.	.	(0.062)	.	.	(0.085)
Relatives	.	.	-0.001	.	.	0.005
	.	.	(0.057)	.	.	(0.078)
Guarantee Officer's Personal Information						
Female	.	.	-0.059	.	.	0.037
	.	.	(0.074)	.	.	(0.100)
Log (Manager's Age)	.	.	0.652**	.	.	0.109
	.	.	(0.300)	.	.	(0.412)
Log (Working Years)	.	.	-0.066	.	.	-0.055
	.	.	(0.066)	.	.	(0.091)
Married	.	.	-0.112	.	.	0.1
	.	.	(0.095)	.	.	(0.130)
Master Degree or Above	.	.	0.012	.	.	0.164
	.	.	(0.099)	.	.	(0.136)
Intercept	-0.197	-0.007	-1.873*	-1.454***	0.587	0.02
	(0.134)	(0.442)	(1.040)	(0.205)	(0.606)	(1.428)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (%)	3.57	5.04	7.36	9.47	28.57	29.41
Observations	585	585	585	585	585	585

Table IV
Determinants of Guarantor's Risk Measure

This table reports the estimates of regressions that examine the relations between the guarantor's risk measure, collateralization and other loan and firm characteristics that may determine the guarantor's risk measure. The dependent variable is *Guarantor's Risk Measure*, ranging from 0 to 1. Larger risk measure represents higher loan risk perceived by the guarantor. The independent variable of interest is *Collateralization*, the ratio of collateral value at loan origination relative to total loan amount. "Guarantor's Private Information" refers to borrower information that is not available to the public and only observed by the guarantor. "Guarantee Officer Personal Information" includes the guarantee officer's age, gender, marital status, education background, and the number of working years in the guarantee industry. We do not report coefficients for all control variables to conserve space. Observations with missing loan rate or guarantor's risk measure are excluded from the sample. We control for loan origination year and borrower industry fixed effects in models 1 to 4. The standard errors corrected for heteroskedasticity are reported in parentheses. ***, **, and * denote statistical significant at the 1%, 5%, and 10% level, respectively. See Table II for detailed variable definitions.

Variable	Model0	Model1	Model2	Model3	Model4
Collateralization	-0.151***	-0.176***	-0.185***	-0.186***	-0.167***
	(0.024)	(0.025)	(0.025)	(0.026)	(0.030)
Firm Characteristics					
Size	.	-0.010	-0.022**	-0.023**	-0.027**
	.	(0.008)	(0.011)	(0.011)	(0.013)
Cash/Total Assets	.	-0.139**	-0.149**	-0.152**	-0.102
	.	(0.066)	(0.067)	(0.068)	(0.081)
Firm Age	.	0.002	0.001	0.001	0.001
	.	(0.001)	(0.001)	(0.001)	(0.002)
Leverage	.	0.106***	0.102***	0.099***	0.063
	.	(0.033)	(0.033)	(0.033)	(0.043)
ROA	.	-0.131**	-0.144**	-0.149***	-0.174***
	.	(0.057)	(0.057)	(0.058)	(0.066)
Sales Growth	.	0.001	0.001	0.002	0.005
	.	(0.004)	(0.004)	(0.004)	(0.006)
Asset Turnover	.	-0.006	-0.007	-0.007	-0.013**
	.	(0.006)	(0.006)	(0.006)	(0.006)
Log (1+# of Current Loans)	.	0.007	0.024**	0.022*	0.017**
	.	(0.007)	(0.011)	(0.011)	(0.009)
Rated by SME Bureau	.	.	0.015	0.015	0.020
	.	.	(0.011)	(0.011)	(0.015)
Previous Loans	.	.	-0.029	-0.025	-0.001
	.	.	(0.016)	(0.018)	(0.000)
Loan Characteristics					
Log (Loan Amount)	.	.	0.019	0.017	0.028
	.	.	(0.014)	(0.015)	(0.019)
Guarantor's Private Information					
Guarantee History	.	.	.	-0.016	-0.030*
	.	.	.	(0.015)	(0.017)
Political Background	.	.	.	-0.006	-0.003
	.	.	.	(0.011)	(0.014)
Relatives Working for the Firm	.	.	.	0.004	0.001
	.	.	.	(0.011)	(0.015)
Intercept	0.526***	0.622***	0.631***	0.571***	0.570***
	(0.021)	(0.075)	(0.076)	(0.093)	(0.101)
Year Fixed Effects	No	Yes	Yes	Yes	Yes
Industry Fixed Effects	No	Yes	Yes	Yes	Yes
Guarantee Officer Personal Information	No	No	No	No	Yes
R-squared (%)	8.33	15.54	30.17	32.12	32.77
Observations	585	585	585	585	585

Table V
Predictability of Guarantor's Soft Information on Loan Default

This table presents the estimates of regressions that examine the predictability of the soft information component of guarantor's risk measure on the defaulted loan amount. The dependent variables are (1) the natural logarithm of the loss amount from loan default; (2) the percentage of loss not covered by collateral, calculated as the amount of loss minus collateral value, scaled by the total amount of loan. The independent variable of interest is *Soft Information of Guarantor's Risk Measure*, measured by the residual from regressing the guarantor's risk measure on the firm's accounting variables observable by both the bank and the guarantor, including log (total assets), cash/total assets, leverage, ROA, sales growth, asset turnover, log (firm age), and log (1+ # of current loans). In Models 2 and 5, we allow collaterlization and firm characteritsic variables to enter the specifications. In Models 3 and 6, we also control for "Guarantor's Private Information" and "Guarantee Officer's Personal Information". "Guarantor's Private Information" refers to information about the borrower that is collected and observed by the guarantor only. "Guarantee History" is a dummy taking one if the borrower ever obtained loan guarantees from the same guarantor before. *Political Background* is a dummy taking one if the firm's manager was ever elected to be the representative of the Peoples' Congress of China. *Relatives Working for the Firm* is a dummy taking one if the firm manager's relatives also work for the firm. "Guarantee Officer's Personal Information" includes the guarantee officer's age (*Age*), gender (*Female*), marital status (*Married*), education background (*Master Degree or Above*), and the number of working years in the guarantee industry (*Working Years*). Observations with missing loan rate or guarantor's risk measure are excluded from the sample. We control for loan origination year, borrower industry and lending bank fixed effects in all specifications. The standard errors corrected for heteroskedasticity are reported in parentheses. ***, **, and * denote statistical significant at the 1%, 5%, and 10% level, respectively. See Table II for detailed variable definitions.

	Log (1+Amount of Loss)			Percentage of Uncovered Amount		
Variable	Model1	Model2	Model3	Model4	Model5	Model6
Soft Information of	0.504**	0.522**	0.526**	1.805***	0.984***	1.027***
Guarantor's Risk Measure	(0.228)	(0.234)	(0.244)	(0.349)	(0.322)	(0.333)
Collateralization	.	0.001	0.001	.	-0.018***	-0.018***
	.	(0.001)	(0.001)	.	(0.002)	(0.002)
Firm Characteristics						
Log (Total Assets)	.	-0.056	-0.061	.	-0.087	-0.097
	.	(0.051)	(0.052)	.	(0.070)	(0.070)
ROA	.	-0.035	-0.103	.	-0.326	-0.402
	.	(0.272)	(0.278)	.	(0.374)	(0.380)
Sales Growth	.	0.028	0.029	.	0.024	0.034
	.	(0.026)	(0.027)	.	(0.036)	(0.037)
Assets Turnover	.	-0.023	-0.033	.	0.021	0.018
	.	(0.030)	(0.031)	.	(0.041)	(0.042)
Cash/Total Assets	.	0.603	0.573	.	0.277	0.323
	.	(0.453)	(0.465)	.	(0.623)	(0.634)
Leverage	.	0.114	0.114	.	0.224	0.256
	.	(0.215)	(0.224)	.	(0.296)	(0.307)
Log (Firm Age)	.	-0.04	-0.042	.	0.012	0.014
	.	(0.034)	(0.035)	.	(0.047)	(0.048)
Log (1+ Current # of Loans)	.	0.054	0.034	.	-0.066	-0.057
	.	(0.040)	(0.043)	.	(0.055)	(0.058)
Guarantor's Private Information						
Guarantee History	.	.	-0.041	.	.	-0.020
	.	.	(0.072)	.	.	(0.098)
Political Background	.	.	0.120*	.	.	0.100
	.	.	(0.062)	.	.	(0.085)
Relatives Working for the Firm	.	.	-0.002	.	.	0.002
	.	.	(0.057)	.	.	(0.078)
Guarantee Officer's Personal Information						
Log (Firm Age)	.	.	0.673**	.	.	0.122
	.	.	(0.300)	.	.	(0.412)
Log (Working Years)	.	.	-0.067	.	.	-0.058
	.	.	(0.066)	.	.	(0.091)
Female	.	.	-0.059	.	.	0.040
	.	.	(0.073)	.	.	(0.100)
Married	.	.	-0.106	.	.	0.104
	.	.	(0.095)	.	.	(0.130)
Master Degree or Above	.	.	0.016	.	.	0.167
	.	.	(0.099)	.	.	(0.136)
Intercept	0.025	0.228	-1.719*	-0.791***	0.984*	0.387
	(0.099)	(0.428)	(1.036)	(0.151)	(0.588)	(1.423)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (%)	4.01	5.43	7.68	10.29	28.72	29.57
Observations	585	585	585	585	585	585

Table VI
Sample Covariance Matrix

This table reports the covariance matrix of key variables that describe pricing of loan (loan rate), pricing of loan guarantee (rate of guarantee fee), guarantor's risk assessment of loans (guarantor's risk measure), collateralization, 1-year Shanghai Interbank Offered Rate (SHIBOR), excess loan rate over cost of fund (loan spread, calculated as loan rate - 1-year SHIBOR) and other loan and borrower characteristics. The values of collateralization larger than 80% are truncated at 80%. The values of loan rate, loan spread, rate of guarantee fee, guarantor's risk measure, SHIBOR and collateralization are in percentage. Size is the logarithm of borrower book assets. Leverage is the book leverage calculated as total book debt over total assets. P-values are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Loan Rate	Rate of Guarantee Fee	Guarantor's Risk Measure	Collatera-lization	SHIBOR	Loan Spread	Size	Leverage
Loan Rate	1.313							
Rate of Guarantee Fee	0.011	0.048						
Guarantor's Risk Measure	-2.585***	0.524***	157.484					
Collateralization	1.582	0.105	-68.651***	597.429				
SHIBOR	0.874***	0.008	-2.108***	−0.113	1.013			
Loan Spread	0.443***	0.003	−0.485	0.133	-0.138***	0.585		
Size	−0.148***	−0.027***	0.648	−3.174***	0.019	−0.176***	0.857	
Leverage	−0.013*	−0.001	0.273***	−0.369*	−0.001	−0.013**	0.032***	0.026

Table VII
Structural Model Estimation

This table reports the maximum likelihood estimates of the model parameters and t-statstics for significance tests. We jointly estimate the two equations:

$$\phi_i = f_G \frac{\bar{x}(1-\pi_i) - (1+r_{0i}) - k(1-c_i)}{1-\pi_i} + (g - c_i)\frac{\pi_i}{1-\pi_i} + \alpha_\phi + \epsilon^\phi{}_i \tag{23}$$

$$r_i = r_{0i} + f_B \frac{\bar{x}(1-\pi_i) - (1+r_{0i}) - k(1-c_i)}{1-\pi_i} + (1 + r_{0i} - g)\frac{\pi_i}{1-\pi_i} - \alpha_\phi + \epsilon^r{}_i \tag{24}$$

where $\bar{x}(1-\pi_i) - (1+r_{0i}) - k(1-c_i)$ is denoted by R_i. We assume the error term $\epsilon^\phi{}_i$ and $\epsilon^r{}_i$ follow bivariate normal distribution so the maximum likelihood function we are optimizating is

$$LL(K_0^\star, K^\star, k, f_B, \bar{X}, \sigma_r^2, \sigma_\phi^2) = -Ilog(2\pi) - \frac{I}{2}\Sigma Log(\sigma^2{}_r \sigma^2{}_\phi) - \frac{1}{2}\Sigma(\frac{\epsilon_{r_i}^2}{\sigma_{r_i}^2} + \frac{\epsilon_{\phi_i}^2}{\sigma_{\phi_i}^2}) \tag{25}$$

We also assume that the guarantor's required risk premium, ρ_G, is a linear function of guarantor's risk measure grm_i: $\rho_G = K_0^\star + K^\star grm_i$. The relationship among variables satisfies:

$$\epsilon_i^\phi = \phi_i - (1 - f_B)\tfrac{R_i}{1-\pi_i} - \rho_{G\,i} - \alpha_\phi \tag{26}$$

$$\epsilon_i^r = r_i - r_{0i} - f_B \tfrac{R_i}{\pi_i} - \rho_{B\,i} + \alpha_\phi \tag{27}$$

$$\tfrac{R_i}{1-\pi_i} = \bar{x} - (1 + r_{0i} + k(1-c_i))(1 + \tfrac{\rho_{G\,i}}{g-c_i}) \tag{28}$$

$$\rho_{B\,i} = \tfrac{1+r_{0i}-g}{g-c_i}\rho_{G\,i} \tag{29}$$

$$\rho_{G\,i} = K_0^\star + K^\star grm_i \tag{30}$$

T-values calculated from the Hessian matrix are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively. None of the model restrictions on the parameters are binding.

Parameter	Estimate	t-Value
$K_0^\star$	-0.00081	-6.36***
$K^\star$	0.00277	34.09***
k	0.00332	1.44*
f_B	0.98230	648.64***
$\bar{X}$	1.09466	504.38***
α_ϕ	0.01883	54.17***
σ_r^2	0.00013	19.15***
σ_ϕ^2	0.0000048	53.47***

Table VIII
Structural Model Estimation: Low Sensitivity

This table reports the maximum likelihood estimates of the model parameters and t-statstics for significance tests, with an additional parameter κ to allow for reduced sensitivity of the guarantee fee to the risk assessment. This is motivated by the fact that sample volatility of the fee in Table VI is a lot less than the model volatility in Table I and some guarantee manager sets the fee in a limited range, such as 1.5% to 2.5%. This is consistent with an economic story that setting the guarantee fee or a range at time of application mitigates a possible hold-up problem at the time the guarantee is granted. The model is the same as in Table VII except for the additional parameter κ in the equation for ϕ.

$$\phi_i = (1 - f_B)\frac{\bar{x}(1-\pi_i) - (1 + r_{0i}) - k(1 - c_i)}{1 - \pi_i} + (1 - \kappa)(g - c_i)\frac{\pi_i}{1 - \pi_i} + \alpha_\phi + \epsilon^\phi{}_i. \quad (31)$$

If $\kappa = 0$, we have the original model, and if $\kappa > 0$ we have reduced sensitivity compared to the base model. The parameter estimates do reject $\kappa = 0$ against the alternative $\kappa > 0$. All the restrictions on the parameters still hold without binding. T-values calculated from the Hessian matrix are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Parameter	Estimate	t-Value
$K_0^\star$	0.00037	3.31***
$K^\star$	0.00184	6.72***
k	0.01486	7.77***
f_B	0.88860	303.38***
$\bar{X}$	1.10380	578.85***
α_ϕ	0.01413	37.81***
κ	0.98974	8.64***
σ_r^2	0.00011	21.25***
σ_ϕ^2	0.0000065	42.99***