

# The Impact of Incentives and Communication Costs on Information Production: Evidence from Bank Lending<sup>\*</sup>

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## Abstract

In 2002 and 2003, many Chinese banks implemented policy reforms that delegated lending decisions to and increased the accountability of individual loan officers. The policy change followed China’s entrance into the WTO and offers a plausibly exogenous shock to loan officer incentives to produce information on borrowers. Using detailed loan-level data from a large, state-owned bank, we find that an internal rating on borrower’s credit risk has a more pronounced effect, beyond observable ‘hard’ information of the borrower, on both price and non-price terms of loan contracts *after* the reform *and* becomes a better predictor of loan outcomes. We also show that when the loan officer and the branch president who approves the loan contract works together for a longer period of time, the rating has an incrementally stronger effect on loan contracts. Our results highlight how incentives and communication costs can affect the quality of information production.

**JEL Classifications:** G2, L2, D8.

**Keywords:** Bank loan, interest rate, default, incentive, communication cost.

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# **The Impact of Incentives and Communication Costs on Information Production: Evidence from Bank Lending**

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## **Abstract**

In 2002 and 2003, many Chinese banks implemented policy reforms that delegated lending decisions to and increased the accountability of individual loan officers. The policy change followed China's entrance into the WTO and offers a plausibly exogenous shock to loan officer incentives to produce information on borrowers. Using detailed loan-level data from a large, state-owned bank, we find that an internal rating on borrower's credit risk has a more pronounced effect, beyond observable 'hard' information of the borrower, on both price and non-price terms of loan contracts *after* the reform *and* becomes a better predictor of loan outcomes. We also show that when the loan officer and the branch president who approves the loan contract works together for a longer period of time, the rating has an incrementally stronger effect on loan contracts. Our results highlight how incentives and communication costs can affect the quality of information production.

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## I. Introduction

High-quality information is essential for the success of business transactions including financial contracting. A growing literature emphasizes the importance of both individual incentives in producing information as well as the cost of communicating that information to decision-making authorities. In this paper, we examine how bank branches with different incentive structures and staff members who have worked together for different periods of time produce and process information in setting both price and non-price terms of loan contracts, and how that information in turn forecasts loan outcomes.

We use data from China, where the banking sector has historically been dominated by large, inefficient state-owned banks relying on centralized decision-making processes. Following China's entrance to the World Trade Organization (WTO) in December 2001, however, many banks, and in particular, state-owned banks, implemented a series of reforms during the second half of 2002 and throughout 2003 focusing on *decentralization*—shifting the responsibilities of making lending decisions from committees to individual officers working in branches that process loan applications.<sup>1</sup> These reforms provide stronger incentives for individual loan officers to produce high-quality information, yet they are plausibly exogenous from the perspective of loan officers because the reform decisions came from the highest level due to external pressure.

To test how a shift in incentives affects contracting, we exploit detailed proprietary loan-level data from a large, nationwide state-owned bank that provides us both contract terms (interest rates and credit limits) and outcomes (default). We extend the literature by testing how incentives to produce information affect, first, how banks use that information to set *ex ante* terms and, second, how well that information forecasts future loan performance. We then test how communication

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<sup>1</sup> The four largest state-owned banks have become publicly listed and traded companies in both domestic and Hong Kong exchanges, with various agencies of the government retaining majority (equity) control. These banks have not been severely affected by the 2007-2009 global financial crisis, and are currently among the largest banks in the world (source: *Bloomberg*). See, e.g., Allen, Qian, Zhang and Zhao (2011) for more details.

costs affects information production, proxied by the time the information producer (loan officers) and final decision maker (branch president) have worked together in the same branch, which has not been examined before in the empirical literature.

Our loan sample covers borrowers with various ownership types located in more than thirty cities across China for the period 1999-2006. We treat loans originated in the first half of 2002 and earlier as the pre-reform period, and loans originated in 2004 and later as the post-reform period. For dependent variables, we include a pricing variable on loans (interest rate) and a non-price variable (the credit limit, or size of the loan), as well as the outcome of the loan (whether it defaults or not). The key explanatory variable is the bank's internally generated credit rating, which measures borrower risk. Before reform these ratings were produced and approved by a *group* of loan officers from the bank's loan investigation unit; after reform, however, *individual* loan officers within the unit become responsible for the ratings and can be held liable for bad loans extended based on inaccurate or biased ratings. In our basic models, we examine and compare the impact of this internal credit rating on loan contract terms and performance during the pre- and post-reform periods by interacting the rating with a post-reform indicator. As control variables, we include firm location, industry and year fixed effects, as well as measures of 'hard' information about the borrowers—firm size, return on assets (ROA), leverage and prior credit history, as well as the interactions between firm characteristics and the policy innovation (i.e., the post-reform dummy).

In the first portion of our analysis, we test theoretical predictions that decentralization granting authority and accountability to individuals strengthens incentives to produce high-quality information (e.g., Aghion and Tirole, 1997). We find that the internal credit rating has a stronger effect, conditional on observable borrower characteristics, on both the price and non-price loan terms after reform than before reform. A better credit rating leads to a greater reduction in interest rates and greater increase in loan size in the post-reform period. Given that interest rates are

partially controlled in China in that the central bank sets the upper and lower bounds on interest rates on loans and deposits, it makes sense that we also find credit ratings play a greater role in setting credit limits (loan size) in addition to interest rates. This result also confirms that lenders use multiple contracting dimensions beyond the interest rate to solve control problems and to mitigate risk. We then show that the information content embedded in both the credit rating *and* the ex ante loan interest rate improve post reform. Both the credit rating and the interest rate become better predictors of loan default after the reform. In particular, with better incentives, banks produce higher quality information to set loan interest rates, which in turn leads to greater predictive power of the interest rate on loan default.

In our second set of tests, we consider how communication costs affect the transmission and use of information. Theoretical research (e.g., Crawford and Sobel, 1982; Bolton and Dewatripont, 1994; Dessein, 2002; Dewatripont and Tirole, 2005; Harris and Raviv, 2005, 2008) shows that communications are costly because it takes time and effort for an agent to absorb new information sent by others *and* because agents may have (different) biases when sending and interpreting information. In our setting, when the loan officer and the head of the *same* bank branch (who approves the loan contract) have worked together for a longer period of time, familiarity between the pair ought to lower communication costs in both dimensions. Since we can identify the loan officer responsible for the credit rating for the post-reform period only, we examine the incremental effect of time worked together between the pair of loan officer and branch head on the terms of loan contracts and outcome on a subsample of loans post reform.

We find that an increase in the time worked together for the pair leads to a more pronounced effect of the internal rating on both interest rates and loan size, even after controlling separately for the work experience of the loan officer and branch president (who may have worked at other branches), as well as their interactions with the rating. Moreover, we find that both the internal

credit rating and the interest rate on the loan predict loan outcomes better as the length of time together increases. These results support theoretical prediction that communication costs affect both the quality of information production (low cost leads to better production of information) and how information is used in the decision process (low cost and better quality lead to greater weight being placed on information produced).

Our paper contributes to and extends the literature on the role of information in financial contracting. Despite ample theoretical work, and in particular, understanding how incentives and communication costs affect the production and use of information, there is only limited empirical validation of these theories. One difficulty has been a dearth of plausibly exogenous variation across firms in incentive structures. An additional obstacle has been difficulty finding plausible measures of communication costs that can be converted into quantitative variables, and measures of ‘outcomes’ of communications. Our results, based on exogenous shocks to the banking sector, detailed loan-level data including both the terms of the loan contracts and outcome, as well as job-related history of loan officers and bank branch presidents, highlight the importance of incentive structures and communication costs for the production and transmission of information. Better information, we find, expands the supply of credit and improves (lending) outcomes.

Our results are of particular relevance for emerging economies that aim to develop their financial institutions. Given the ‘populist’ demand for tighter regulations on financial institutions following the 2007-2009 global financial crisis, our results also call for more caution in excessive regulations (in any country) as they may destroy the incentive structure to produce high-quality information and increase the costs of transmitting information, both of which are central to financial contracting (as well as other business transactions).

There are a few recent empirical studies in banking that exploit how variations in banks affect information production and usage, but they are unable to exploit plausibly exogenous

variations such as the policy innovation in China as in our context. For example, Berger et al. (2005) compare the use of information for large versus small U.S. banks, finding that smaller organizations seem better able to provide incentives for investment in information beyond the publicly observable signals. Based on a loan officer rotation program from one Argentine bank, Hertzberg, Liberti and Paravisini (2010) find that internal ratings from loan officers in anticipation of rotation are better predictor of default, since these officers have a stronger incentive to report bad news on the borrowers.<sup>2</sup> Our tests are based on an exogenous policy shock to incentives within the same bank and a direct measure of communication costs between officer and branch president. Moreover, we examine the effects of internal ratings on loan interest rates and size, and the effects of both the ratings and interest rates on loan outcomes. Finally, other papers find physical distance between lenders and borrowers adversely affects the quality of information (e.g., Petersen and Rajan, 2002; Degryse and Ongena, 2005; Agarwal and Hauswald, 2010a).<sup>3</sup> What we show is that a form of ‘*organizational distance*’—communication costs between the information producer and decision maker—can also reduce the quality of information.

The rest of the paper is organized as follows. In Section II, we describe China’s banking sector and the policy reforms that we exploit as our main identification strategy. We also review related strands of literature on the production and use of information. In Section III, we describe our sample of bank loans, and then present the empirical tests, results and discussions. Section IV concludes the paper. The Appendix contains case studies on how credit ratings are created.

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<sup>2</sup> In addition, Liberti and Mian (2010) use data from one bank in Argentina to explore how hierarchies within banks affect the use of information in determining credit limits, Mian (2006) shows that domestic banks tend to invest more in relationship, while Liberti (2004) exploits a change in incentives within a bank, finding that effort by lending officers to invest in soft information increases.

<sup>3</sup> In addition, Chang et al. (2010) use information from one bank in China and find that ratings are better predictor of loan default when the bank has a long-term relationship with borrowers. We also include the distance between the headquarters of the borrower and the *nearest* branch (of any lending institution in the area) to measure geographical distance, and find a negative impact on information production. However, the impact is not statistically significant (and not reported in tables) in part due to extensive branching throughout the country by all major Chinese banks.

## **II. Institutional Environment, Organization Structure, and Lending Process**

In this section we first describe China's banking sector, including the lending process of state-owned banks and the regulatory environment. We then describe the policy change as a result of China's entrance to WTO in 2001. We also briefly review related strands of literature on information transmissions, organizational structure and financial contracting.

### **II.1 Overview of China's Banking Sector and Lending Process**

The large banking system has played an important role in financing the growth of China's economy, now the second largest in the world (Allen, Qian and Qian, 2005). The four largest, state-owned commercial banks have nation-wide networks of branches and control the majority of assets in the banking system, although their dominant status has been weakened in recent years with the entrance and growth of many domestic and foreign banks and non-bank financial institutions.

The most glaring problem of the banking sector had been high non-performing loans (NPLs), most of which accumulated in the 'Big Four' state-owned banks from poor lending decisions to state-owned enterprises (SOEs). Following the Asian Financial Crisis in 1997, China's financial sector reform began to focus on state-owned banks, with the goal of improving their efficiency—i.e., to make these banks behave more like profit-maximizing commercial banks and lowering the level of NPLs. With the help of sustained economic growth, the government's concerted effort during the past decade has paid off, as NPLs have been steadily decreasing after peaking during 2000-2001. All of the Big Four banks have become publicly listed and traded companies (in both domestic and Hong Kong exchanges) in recent years, with the government and its various agencies retaining majority control (through the holding of large equity blocks). With prudent investment approaches, these banks have not been severely affected by the 2007-2009 global financial crisis, and are currently among the largest banks (both in terms of market capitalization and assets) in the world.



China's banking sector, as other sectors of 'strategic importance,' has been under intensive monitoring by the government, mainly through its central bank (People's Bank of China, or PBOC). The PBOC limits the movements of interest rates on both deposits and loans by setting base rates along with upper and lower bounds, and these rates and bounds vary over business cycles and with loan maturities. Figure 1 shows the movements of (regulated) interest rates during our sample period. Within the specified bounds, however, lenders (and borrowers) can freely choose to set interest rates. In our empirical tests, we use both the actual rates and adjusted rates standardized by the standard deviation of rates in a given period (e.g., one year). Since interest rates can only vary within bounds, thus limiting the *ex ante* pricing tool for banks to control risk, we also look at the most important non-price loan term, the credit limit (i.e. the loan size).<sup>4</sup>

China's entry into the WTO in December 2001 marked a new phase of its integration into global markets and economies—all member countries of the WTO must (eventually) open up domestic markets and allow frequent and large-scale capital flows. In anticipation of much more competition from foreign (and domestic) financial institutions, many Chinese banks, especially those that are ultimately owned by the government, began implementing a series of reforms during the second half of 2002. These reforms were not triggered by any specific problem; rather, the decision to reform was made at the highest level to improve the competitiveness of all large state-owned banks against pending foreign competition.<sup>5</sup> Therefore, in our view these reforms provide plausibly exogenous shocks to the banking sector, particularly from the view of the loan officers at

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<sup>4</sup> We do not consider loan maturities as a dependent variable. Given the uncertainty in how the government sets and changes upper and lower bounds on interest rates, most of the loans in our sample have a maturity less than one year. Moreover, since the bounds on interest rates vary with loan maturities, it is unclear whether loan maturity is an independently chosen contract term.

<sup>5</sup> The growth of financial institutions outside the Big Four banks is visible in the data. For example, in 2001, the total assets, deposits, and loans made of all "other commercial banks," where various joined ownerships are forged among investors and local governments, and foreign banks, are about a quarter of those of the Big Four banks; in 2008, the scale of these institutions in the same categories is more than half of the Big Four banks. See, e.g., Allen, Qian, Zhang and Zhao (2011), and the *Almanac of China's Finance and Banking* (2000-2008), for more details.

different branches across the country.

One of the central themes in this round of reforms is decentralization—imposing greater responsibilities on individual loan officers in charge of different stages of lending. Under the old regime, the entire lending process, from loan application and the initial screening of borrowers to the final approval of the terms of loan contracts, was done within the same branch by possibly the same group of employees (and signed off by the head of the branch) without any clear designation of individual responsibilities. Since the ‘group’ is responsible for every step of the lending process, individual officers lacked the incentive to perform their tasks. Under the new regime, there are up to five subgroups/divisions within a branch, each with clearly defined functions/roles during the lending process: (initial) investigation, verification, deliberation and discussion, approval, and post-loan monitoring and management. Individual officers must sign off on the reports produced along each step of the process. In particular, loan officers from the investigation unit are responsible for the internal ratings and can be held liable for bad loans extended based on inaccurate ratings.<sup>6</sup>

While the delegation of important steps and tasks to individual employees aims to enhance their incentives to exert efforts and improve the accuracy and efficiency of the lending process, the approval of the final terms of the loan contract is left with a committee (through voting) consisting of senior officials of the branch, chaired by the bank branch president and with at least one official *not* involved with any of the earlier stages of the lending process. The reason for this approach is to avoid granting excessive power to one or a few individual officers, which could induce corruption and other bad behaviors.

Once a loan is made, the bank/lender enters the post-loan management phase and actively monitors the borrower and continues to reassess the (repayment) risk. If a firm defaults on the

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<sup>6</sup> Based on internal documents and discussions with bank officials, we know that, post-reform, the performance of loans is one of the measures used in the evaluation of loan officers (in compensation and promotion/demotion decisions), while the branch president is responsible for the performance of the entire branch.

loan—failure to pay the interests and/or principal amount on time, the bank typically (privately) works out a loan/debt restructuring plan with the firm. The bank can also take a number of other actions, including repossessing collateralized assets, asking the guarantor(s) (individuals, firms, or other entities) of the loan to repay, or taking the firm to court. In some cases involving a defaulted state-owned firm/borrower, the government may step in and (partially) repay the bank.

Accordingly, in our empirical tests we distinguish borrowers' ownership types—i.e., whether it is ultimately owned by the state or not.<sup>7</sup>

## **II.2 Theoretical Background and Hypotheses on Information Production and Contracting**

Theoretical work has examined two related aspects of information production and transmission (see, e.g., Petersen, 2004, for a review). First, individuals with more authority and responsibilities have a stronger incentive to produce high-quality information so as to put their own stamp in the decision process (see, e.g., Agarwal and Hauswald, 2010b, for empirical evidence). Second, there are frictions in the communication and decision-making processes regarding the information produced: first, it takes time and effort for an agent to absorb new information sent by others, and second, different agents may have biases and different preferences when sending and interpreting information (e.g., Crawford and Sobel, 1982; Radner, 1993; Bolton and Dewatripont, 1994; Dewatripont and Tirole, 2005; Garicano, 2000). More recently, there is a strand of theoretical literature (e.g., Dessein, 2002; Harris and Raviv, 2005, 2008; Chakraborty and Yilmaz; Malenko, 2011) studying the cost of communications within a group including an informed agent, whose incentives may be misaligned with those of the principal—for instance, among the CEO and Board of Directors of a public firm. The main trade-off is that while too much delegation to the informed

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<sup>7</sup> China enacted a new bankruptcy law in August 2006 (effective on June 1, 2007), which applies to all enterprises except partnerships and sole proprietorships. In many aspects the new law resembles bankruptcy laws in developed countries such as the UK. For example, it introduces the (independent) bankruptcy administrator, who manages the assets of the debtor after the court has accepted the bankruptcy filing. Despite all the legal procedures specified by the law, enforcement of the law remains weak and inconsistent.

agent in gathering information and decision-making can result in information manipulations and suboptimal decisions, too little delegation may lead to less information production and the loss of valuable information.

Testing these theories has been challenging. First, finding plausibly exogenous variations in incentive structures is a necessary, but difficult, condition to draw clear inferences. Second, empirical measures of communication costs that can be converted into quantitative variables are difficult to come by, and so are the measures of ‘outcomes’ of communications. For example, in the case of corporate governance, it is difficult to link the outcome of a major corporate decision (e.g., on a potential merger) to specific communications among the CEO and members of the board. In our setting, we can identify an exogenous shock to the incentives within organizations (banks) based on the policy reform described above, and we can use detailed job-related histories to measure communication costs. With the reform as our main identification strategy, we test how different incentive structures within firms affect the production, quality and use of information. With the information on personnel, we use the time worked together between the loan officer (information producer) and the branch president (decision maker) to proxy for communication cost. Communication costs should vary between pairs of loan officers and branch presidents. In particular, the marginal costs of understanding each other should fall with familiarity as greater time together allows each to better understand the other’s (private) preferences and information produced and transmitted. However, familiarity does not guarantee that information produced is of higher quality—for example, it may be easier for a pair of branch president and loan officer who have worked together for an extended period to ‘collude’ and favor certain questionable borrowers. Hence, it is important to use loan outcome (whether the borrower defaults or not) to gauge the quality of the internal ratings and effectiveness of communications between the loan officer and branch president.

In our first set of tests, we examine how credit ratings affect ex ante loans terms before vs. after reform. If individual loan officers have a stronger incentive to produce information after reform, their internally generated credit ratings should better explain contract terms after reform (controlling for information on the borrowers such as size, ROA, leverage, credit history, etc.). Because the effectiveness of using interest rates to price and control risk is limited in environments of asymmetric information and weak enforcement (e.g., Stiglitz and Weiss, 1981; Diamond, 2004; Qian and Strahan, 2007), we also examine the credit limit. So, improvements in the internal credit ratings should lead to greater increases in loan size and decrease in interest rates in the post-reform period. In addition, lower communication costs between the loan officer and branch chief ought to increase how much weight the branch places on the credit rating to set loan terms. Hence, we test how loan terms vary with the interaction between the number of years the loan officer has worked with the branch president and the credit rating. We then estimate a parallel set of tests using ex post outcomes based on repayment history as the dependent variable; this strategy attempts to validate the bank's ex ante decisions. That is, if the bank places greater weight on credit ratings in the post-reform period in setting loan terms, then we would expect the ratings also to forecast loan outcomes better after reform than before. If the total information produced by the bank improves, the forecasting power of the loan interest rate on future outcomes also ought to improve.

### **III. Data, Empirical Methods and Results**

Our proprietary data come from a large bank that is ultimately owned by the state and has a nationwide network of branches that handle deposits and loan applications. The bank provides us with a large sample of loans with borrower firms coming from more than thirty cities of different sizes, located in all the regions of China, including the developed coastal area, the northeastern

(traditional) industrial base, and less developed inland regions. There are small bank branches in the sample located in rural counties, and large branches located in provincial capitals, as well as branches in between. We include city fixed effects in all of our tests.

### III.1 Summary Statistics

Table 1 reports summary statistics for borrower characteristics (Panel A), which we include as independent variables in our tests, terms of the loan contracts that we use as dependent variables (Panel B), and information on the experience of individual loan officers and bank branch presidents and the time worked together for officer/branch president pairs (Panel C). During the pre-reform sample, the firm asset size averaged RMB 201 million, rising to RMB 354 million in the post-reform sample; during the same period average loan size rises from RMB 4.13 million to RMB 6.63 million (Panel B).<sup>8</sup> Leverage (total debt *before* the loan / total assets) was lower in the post-reform years (0.52 v. 0.45), whereas firm profitability was higher post reform (return on assets, or ROA, rising from 6% to 9% at the mean). Despite better average firm characteristics in the post-reform period, the average rating is slightly worse in the post-reform period (5.45 vs. 5.29; the median rating is the same for both periods, at 5; the range is 1 to 8, a higher score means safer borrower).

As noted above, the PBOC sets an upper and lower bound for interest rates that adjusts around a base rate. The base rate is set by the PBOC to further goals for macro-stabilization policy, so this base rate varies over time, as well as across loans with different maturities. As shown in Figure 1, the upper bound (as percentage of the base rate) rises over time while the lower bound remains the same (90% of the base rate). Therefore, using raw interest rates may generate biased coefficients because lenders can set much higher rates during later years of the sample—the

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<sup>8</sup> We use RMB, the Chinese currency, to denote loan and firm size variables. The official exchange rate was US\$1 = RMB 8.28 before 2005; despite significant (and gradual) appreciation of the RMB over U.S. dollar and other major currencies since 2005 (as of September, 2011 the spot rate is \$1 = RMB 6.39), much debate remains on the extent to which the RMB is undervalued.

maximum raw rate is indeed higher in the post-reform period and so is the standard deviation of rates (0.98% in the post-reform period vs. 0.59% in the pre-reform period), although the mean rates are similar (Table 1, Panel B). We therefore normalize interest rate by the ratio of the raw rate and the standard deviation of rates in a given period. We use two sets of standardized rates: first, we use the standard deviation of interest rates of a given year to adjust all the rates in that year, and label these rates “standardized rates 1”; and second, we use the standard deviation of interest rates during the pre-reform period (post-reform period) to adjust all the pre-reform (post-reform) rates and label these rates “standardized rates 2.” The mean standardized rate for the post-reform period is lower than that of the pre-reform period using either standardization method. In our tests below we report results from using the raw rates and both sets of standardized rates.

As discussed earlier, we measure communication cost with the time overlap between a loan officer (who builds the credit ratings) and the branch president (who approves the loans) for the loans where we can identify the loan officer responsible for the rating. This measure is only available after reform because only then are individuals held accountable for the credit ratings. Table 1, Panel C presents data on the subset of loans during this period from which we can observe the data. For each of these 2,597 loans, we collect information on the experience of the loan officer and the bank branch president as well as the time worked together in the same branch between the pair. The average tenure of a branch head is longer than that of the average loan officer, while the average duration of a pair of loan officer and branch president is about 1.69 years.

Our main measure of information production equals the loan officer’s subjective rating of the borrower firm, which ranges from one to eight, where eight represents borrowers with the lowest default risk category (and thus borrowers with the highest credit quality). As described above, prior to the reform (first half of 2002 and earlier), individual officers who produced the ratings did not need to sign off on the ratings report; rather, this report and all the subsequent reports

related to the verification and approval of the loan are signed by the same executive(s) of the branch. However, after the reform (2004 and later), individual loan officers must sign the ratings report and bear personal responsibilities for the quality of the report.

Based on internal documents and discussions with bank officials at different levels and branches, we know that the production of ratings is based on the loan officers' evaluation of the (borrower) firm's recent and past performance, both in terms of its own profitability and records in repaying loans in the past, as well as its projected growth/performance during the loan period. The evaluation process also includes discussions with borrower firms' executives, potential guarantors, business partners and customers, and local government officials who may have a vested interest in the firm. Therefore, the rating process embeds the usage of both hard information as well as 'soft' information that may not be publicly available or verifiable (Stein, 2002), and possibly may be altered by the personal interests of the officers when the report is produced. In Appendix A we provide two case studies on how the ratings are created and what types of information (hard and soft) are included. These case studies also show that not all information is accurate or used properly, leading to different quality (of these ratings) in predicting the outcome of the loans.

Figure 2 plots two histograms of the *actual* distributions of the ratings during the pre-reform and post-reform periods. There are several salient differences between these two distributions. During the pre-reform years, almost no borrowers receive ratings in the lowest two categories, whereas over 5% of borrowers receive scores in the lowest two bins in the post-reform period. In addition, over 25% of the borrowers receive a score of 3 while only 6% received a score of 5 during the pre-reform period, while the opposite seemed to be the case post reform. As discussed earlier, borrowers appear to be in better financial conditions post reform than during the pre-reform period, yet the average rating in the post-reform period is slightly lower than that of the pre-reform period. Making loan officers more accountable for credit ratings (based on ex-post loan performance) may



change both the information content of credit ratings *and* shift the distribution of ratings. For example, risk-averse loan officers may be less willing to grant the highest scores if they fear being held accountable for borrower defaults. Increased lender conservatism could thus shift the distribution of scores to the left even if average borrower risk has not changed.<sup>9</sup>

As a preliminary test for information effects of reform, we estimate predictive models for the internal credit rating from both the pre- and post-reform samples. That is, we regress the actual credit scores on borrower observables. The model includes the log of borrower assets, leverage, return on assets, whether the borrower defaulted on a loan in the previous year, and indicators for state-owned enterprises, private enterprises, industry and city.

Table 2 presents the results. Several interesting findings emerge from the comparisons of the regressions. First, all the explanatory variables have significant (and sensible) effects on ratings in the post-reform period, with signs of the coefficients that are consistent with the prediction that firms in better financial conditions and prior credit records receive higher ratings. By contrast, in the pre-reform period, a firm that has defaulted on a loan before (during the 12 month-period before applying the current loan) actually has a *better* credit rating. Second, coefficient magnitudes increase in the post-reform period. For example, the coefficient on ROA (profits divided by assets in the year prior to loan origination) more than doubles for the post-reform period relative to the pre-reform period. Third, adjusted  $R^2$  of the post-reform regression is higher than that of the pre-reform period (columns 1 and 2), despite having a much larger sample (33,996 v. 3,665). Moreover, almost all of the explanatory power in the pre-reform sample comes from the fixed effects; if we drop these, the adjusted  $R^2$  falls from 0.385 to 0.0849 (compare columns 1 and 3). In contrast, dropping the fixed effects from the post-reform sample only lowers adjusted  $R^2$  from 0.393

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<sup>9</sup> Agarwal and Wang (2009) use data from small business loan officer compensation from a major U.S. commercial bank and find that incentive-based compensation (without much downside penalties) increases loan origination and induce the loan officers to book more risky loans.

to 0.244 (compare columns 2 and 4). The credit rating thus reflects borrower financial characteristics (as opposed to simple city, year and industry effects) much more after the reform, consistent with improved loan-officer incentives leading to better information production. Given this sharp difference on *observable* dimensions, it seems plausible that *unobservable* borrower characteristics (e.g. ‘soft’ information, character, relationships with customer and governments, etc.) would also be better impounded into the rating after the reform.

### **III.2 Empirical Strategy**

Our empirical strategy first tests whether links between the bank’s credit rating and the loan interest rate, the credit limit (log of loan size), and the loan default outcome strengthen when: 1) individual incentive and responsibility for producing better ratings increases (after reform v. before); and, 2) communication costs fall between the loan officer (who produces information) and the final decision-maker (executive at the same branch of the loan officer). Second, to assess if the *overall* production of information really improves, as opposed to a change in the formal credit rating report, we test whether the loan interest rate itself better predicts loan outcomes: 1) after reform v. before reform; and, 2) for loans made by officer’s working longer with the branch president. As discussed earlier, the changes in individual responsibilities occurred in 2002 and 2003 in response to increasing pressure on state-owned banks to adopt best practice after China entered the WTO. This change is plausibly exogenous from the perspective of the loan officers engaged in information production and contracting with borrowers.

Because time worked together between the loan officer and the executive of the same branch will mechanically correlate with the experience of both individuals, we also include the experience of the loan officer and of branch president as separate control variables in the model. Our measure of communication cost is only available after 2002, so we report this specification without the policy reform interaction. In these regressions, our key variable is the interaction between the credit

rating (and interest rate) with the variable *time worked together*. One concern with this test may be that assignments of borrowers to loan officers endogenously reflect the importance of information production. For example, if low communication costs are more important for loans made to especially opaque or risky borrowers, then the effect of the credit rating on both the ex ante terms and ex post outcomes may be attenuated for these loans. To assess how important this concern may be, we test whether loan assignments are correlated with individual experiences and, more critically, time worked together between the loan officer and the branch president.

To summarize, we build three sets of models. In the first, we use the credit rating (ranging from 1 to 8, where higher means better credit quality) while controlling for borrower characteristics and fixed effects, and we interact a post-reform indicator with the credit rating to examine differential effects of the rating on loan terms and outcomes. In the second, we use the post-reform period only, and we interact the *time worked together* variable with the rating. In the third set of models, we replace the credit rating with the loan interest rate in forecasting default, which should act as a sufficient statistics for the bank's overall assessment of credit quality. Analytically,

$$\begin{aligned} \text{Loan term (or default)}_{i,t} = & \beta^1 \text{Rating}_{i,t} + \beta^2 \text{Rating}_{i,t} \times \text{Post-reform}_t + \text{Fixed effects} \\ & + \text{Firm controls and interactions} + \varepsilon_{i,t}, \\ & t = 1999-2006 \text{ (second half of 2002 and 2003 omitted)} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Loan term (or default)}_{i,t} = & \beta^1 \text{Rating}_{i,t} + \beta^2 \text{Time Worked Together}_{i,t} + \\ & \beta^3 \text{Rating}_{i,t} \times \text{Time Worked Together}_{i,t} + \text{Individual Experiences and Interactions with} \\ & \text{Ratings} + \text{Fixed effects} + \text{Firm controls and interactions}_{i,t} + \varepsilon_{i,t}, \\ & t = 2004-2006 \text{ (post-reform subsample only)} \end{aligned} \quad (2)$$

$$\begin{aligned} \text{Default}_{i,t} = & \beta^1 \text{Interest rate}_{i,t} + \beta^2 \text{Interest rate}_{i,t} \times \text{Post-reform}_t \\ & + \text{Firm controls and interactions} + \text{Fixed effects} + \varepsilon_{i,t}, \\ & t = 1999-2006 \text{ (second half of 2002 and 2003 omitted)} \end{aligned} \quad (3a)$$

$$\begin{aligned}
\text{Default}_{i,t} = & \beta^1 \text{Interest rate}_{i,t} + \beta^2 \text{Time Worked Together}_{i,t} + \\
& \beta^3 \text{Interest rate}_{i,t} \times \text{Time Worked Together}_{i,t} + \text{Individual Experiences and} \\
& \text{Interactions with Interest Rate} + \text{Fixed effects and Firm controls} + \varepsilon_{i,t}, \\
& t = 2004-2006 \text{ (post-reform subsample only)}
\end{aligned}
\tag{3b}$$

where  $i$  indexes borrowers and  $t$  indexes years. The structure is not a true panel because many of the borrowers appear in the sample just once, but we do include year, city and industry fixed effects in all of the models, and we cluster standard errors by the borrower firms. The year effects absorb the direct impact of the *Post-reform* indicator (as well as absorbing time-varying macro-economic conditions), so we only report its interaction with the credit rating in the tables.

In estimating Equations (1) and (2), we report three models for loan price and one measure (one model) for loan size. As discussed earlier, the pricing measure is based on both the actual rate and two types of normalized rates; our non-price loan term equals the log of the amount of credit approved for the borrower on the loan; we model both sets of variables using OLS.<sup>10</sup> Our measure of loan outcomes (equations 1-3) equals one for loans that are paid off in full and on time, and zero otherwise; we report probit regressions comparable to (1) and (2) above for this variable.

The key variables of interest are the interaction effects between the credit rating and: 1) the policy innovation (*Post-reform*); 2) the length of time worked together between a loan officer and branch president (*time worked together*).<sup>11</sup> We would expect that an increase in the credit rating would lead to lower interest rates, greater credit limits, and better outcomes. The marginal effect of rating ought to strengthen after 2003 with better loan officer incentives, or when the time worked together is longer. Hence, we expect the same sign for  $\beta^1$  and  $\beta^2$  in Eq. (1) and  $\beta^1$  and  $\beta^3$  in Eq. (2). Similarly, we expect higher interest rates to be associated with greater default risk, and a stronger link between rates and outcomes after 2003 or when the time worked together is longer. Hence we

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<sup>10</sup> We would also like to study the probability of loan approval, but this variable is not available in our dataset.

<sup>11</sup> Once again, we drop the data from the second half of 2002 and 2003, the period of the policy change.

expect the same sign for  $\beta^1$  and  $\beta^2$  in Eq. (3a) and  $\beta^1$  and  $\beta^3$  in Eq. (3b).

Our control variables for borrower credit quality include the log of borrower assets, the (lagged) return on assets (ROA), leverage, and indicator equal to one if the borrower has defaulted on a prior loan, indicators for SOEs (state-owned enterprises) and privately owned firms (all the other ownership types, including mixture of local government and private ownerships, are the omitted group), and for loan types and purposes (e.g., fixed assets investment, real estate investment, and working capital). Each of the firm characteristics is measured in the year prior to loan origination. For Eq. (1) and (3a), we also include the full set of interactions between each of our borrower control variables with the policy innovation (*Post-reform*).

### **III.3 Results**

Tables 3 and 5 report the main results for ex ante loan terms, and Tables 7 and 8 report results on loan outcomes; these are the estimations of Equations (1), (2), (3a) and (3b). Table 4 reports correlations between borrower characteristics and variables describing communication costs between loan officer and branch executive – *time working together*, as well as their individual experiences. Table 6 reports descriptive statistics on loan outcomes.

#### ***Ex Ante Contract Terms***

Table 3 reports OLS for three sets of variables of loan pricing, and OLS for the non-price term (log loan size). For each model, we include industry, year and city fixed effects, control for borrower characteristics, and interact each of these characteristics with the post-reform indicator. We do not report the coefficients on the interactions between the post-reform dummy and the borrower controls, however, to save space in the tables.

The results suggest that increasing the accountability of loan officers improves the value of the information that they create. Lenders place greater weight on loan-officer-produced credit

ratings in setting ex ante loan terms after reform than before (Table 3). The effect of the rating prior to reform is small and not statistically significant in either the pricing or credit-limit equations. Its effect becomes large, both statistically and economically, after reform. For example, based on Table 3, Column 1, increasing the credit rating from the 25<sup>th</sup> to the 75<sup>th</sup> percentile (an increase of about 4 notches) lowers the actual interest rate by 0.26% [ $= 4 \times (0.005 - 0.071)$ ] - an economically significant effect relative to the standard deviation of interest rates in the post-reform period of 0.98%. In addition, raising the rating by 4 notches increases loan size by about 3.2% post reform [ $= 4 \times (-0.016 + 0.024)$ ].

So, there seems to be no marginal value to the credit rating, above what can be predicted from simple measures of borrower observables, when the rating itself was developed by the lending committees. That is, prior to reform the credit rating is both somewhat inflated (recall Figure 2) and devoid of meaningful information. After reform, when individual lenders become more responsible and accountable for what they produce, the credit rating adds substantive power to explain loan terms. The effects of most of the firm control variables enter the models as expected. For example, larger firms with better operating performance (ROA) receive better terms—lower interest rates and larger credit limits—on their loans.

Since we have a much greater number of loans in the post-reform period than in the pre-reform period, which may reflect banks' expansion policies in lending (the economy was booming), one concern of the results reported in Table 3 is that they may be driven by the possible changes in the distribution of loans. As a robustness check, we rerun tests in Table 3 on a subsample of firms that borrow from the bank in *both* the pre- and post-reform periods (results not reported). The sample size drops (to about 8,000 loans) but we obtain similar results on the impact of ratings in the two periods. We conclude that the results obtained in Table 3 are not due to a change in the distribution of loans over the two periods. Another change in the post-reform period

that could affect the results reported in Table 3 is that the banking sector becomes more competitive in most regions. More competition puts pressure on each bank to produce better information regardless of banks' internal changes and reforms. We include the (log of) number of lending institutions around the borrower firms (at the zip code level) in both periods and also interact this variable with the post-reform dummy. We obtain similar results on the interaction between credit rating and the post-reform dummy. Hence, the greater impact of ratings on loan terms in the post-reform period is not driven by increased competition in the banking sector alone.<sup>12</sup>

Before we examine the effects of communication costs on the use of information, we first examine whether there is any consistent correlation between loan assignments and borrower characteristics. This is important because, as mentioned above, we do not have an exogenous policy instrument to vary communication costs. It may be that riskier loans are assigned to more experienced loan officers, or to loan officers who are closer to, and thus can communicate better with, the branch president. From Table 4, however, the correlations between firm characteristics and individual experiences and time worked together are quite low – almost always less than 0.1 in absolute value. Moreover, there are no consistent patterns in these correlations that would indicate systematic, non-random assignment of loans. For example, large firms are somewhat less likely to be assigned to loan officers with a long history with the branch president ( $\rho = -0.078$ ), but firms that have defaulted are less apt to be paired with loan officers working for a long time with the president ( $\rho = -0.109$ ). There is virtually no correlation between ROA and *time worked together* ( $\rho = 0.04$ ). And, the credit rating has a correlation of just 0.083 with *time worked together*. Hence, we can conclude that non-random assignment of borrowers to loan officers is unlikely to create an important attenuation in our results.

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<sup>12</sup> We also perform the same two robustness checks on ex post loan outcomes (see Table 7 below), and our main result that credit ratings become better predictor of loan default still holds in both cases.

Table 5 reports estimates for Equation (2), using the ex ante loans terms as dependent variables. The first four columns introduce the three experience variables, along with the credit rating and the other controls; the next four columns introduce an interaction between *time worked together* (loan officer/branch president) and the rating; the last four columns then add interactions between the rating and the other two work experience variables (*loan officer experience* and *branch president's experience*).

From the first four columns, we estimate a somewhat larger impact of the credit rating on the interest rate, relative to what was estimated in Table 3, and somewhat smaller for the loan size regression. At the same time, the *time worked together* variable is significantly related to the interest rates, while *branch president's experience* and *loan officer experience* are not. For example, interest rates are somewhat lower when loan officers have longer histories with the branch president. Increasing this *time worked together* by one standard deviation (1.4 years) comes with a decline in the actual interest rate by 0.12% ( $= -0.083 \times 1.4$ ; Column 1).

Columns (5) to (12) of Table 5 show that the marginal effect of the credit rating on loan contracts grows as loan officer time with the president increases. At the mean of *time worked together* (1.69 years), a four notch increase in the credit rating would lead to a decline in the actual rate by 0.37% in Column 5 [ $= (-0.041 - 0.031 \times 1.69) \times 4$ ]; the same four notch increase would result in a decline by 0.55% in the interest rate [ $= (-0.041 - 0.031 \times 3.1) \times 4$ ] when the *time worked together* rises by one standard deviation (to 3.1 years). This result is robust to including the other two experience variables interacted with the credit rating (e.g. Columns 9-12). In fact, only *time worked together* consistently increases the impact of the rating on loan terms, suggesting that when loan officers can communicate effectively with the ultimate decision authority, the bank places greater weight on the officer's recommendation (i.e. on the rating).

### ***Ex Post Outcomes***



We have seen that the bank places greater weight on internal ratings when contracting problems between the loan officer and the management of the bank are better contained, both by placing greater responsibility on individual lenders and by reducing the communication costs between the loan officer (information producer) and the bank branch executive (decision maker on the loan). This behavior supports the idea that the rating is more informative when those internal agency problems are less severe.

We now test this idea directly by estimating whether the credit rating predicts outcomes better after reform than before, and whether the rating also predicts outcomes better when communication costs are lower. For our sample of loans, we are able to observe whether the borrower paid the lender on time or was in some kind of default state up to one year after the original loan maturity date as the cutoff late repayment. For example, of the 3,665 loans made in the pre-reform sample, 54% paid off in full and on time. Of the others, most borrowers paid off the loan (one year after the maturity date) but were late on some of the payments. During the post-reform period, where we have a larger sample of loans, the distribution was somewhat more favorable, with about 87% of loans performing in full and on time. The better performance post-reform may be due in part to the policy change, although the economy overall performed better during these years than during the earlier period.

Table 6 reports the simple default statistics by credit rating, divided into pre- and post-reform regimes. As noted earlier, firms with credit scores below 3 appear to gain access to credit after reform, whereas they were rationed out of the market earlier; in addition, very few borrower firms received the highest score (8) in the post-reform period. Comparing outcomes for firms rated 3 or better, the gradient appears steeper and more monotonic after the reform. For example, pre-reform the probability of full and timely repayment rises from 57.7% to only 61.7% as the score moves from 3 to 8; post-reform this probability rises from 72.8% to 100%, and the increase is

monotonic in the credit rating. Moreover, pre-reform the default rate is actually worse for ratings 4-7 relative to ratings bin 3. Only firms in the highest ratings category had better performance than those in the lowest bin.

Table 7 reports outcome regression results using the same structure that we had applied to the ex ante contract terms [recall Equation (1)]. Here the dependent variable equals 1 for loans that paid back in full and on time and zero otherwise; we report the marginal effects from a probit model. In Column 1 we include all the loans from pre- and post-reform periods, and in Columns 2-4 we include that subsample of loans from the post-reform period that we have information on work experience. The regressions are similar in spirit to the conditional means in Table 6, but they control for all of the borrower characteristic and interactions terms.

From Column 1 of Table 7, while firms with higher ratings are less likely to default overall, credit ratings predict default better after reform than before. The coefficient on the interaction of post-reform and the credit rating is statistically significant at the 1% level; together with the direct effect, this indicates that a one-notch improvement in the ratings would increase the likelihood of full repayment of 3.2% (compared to 0.7% for the pre-reform period). This difference is even more compelling than it seems on its face because, as we have seen earlier, better-rated firms borrow more after reform; more credit all else equal would tend to raise, rather than lower, the default rate. Beyond the coefficients of most interest, we do find that all the firm controls (not reported in the table) come in as expected in terms of their impact on the likelihood of default: larger firms, firms with lower leverage, better ROA, no prior default are less likely to default on the current loan.

Columns 2-4 of Table 7 reports models similar to those in Table 5 on the subsample of loans from the post-reform period, but replaces the ex ante terms with ex post default. Here we find, consistent with Column 1, that the credit rating has stronger predictive power in the post-reform sample, with an increase of one notch associated with an increase in full repayment probability of

2.8%. Moreover, we find that outcomes improve with *time worked together* (Column 2), and more importantly, that the marginal impact of the credit rating increases with *time worked together*. We also find that the bank branch president's experience is associated with higher default probability (Columns 2 and 3) but the loan officer's experience does not appear to affect loan outcome; and, none of the experience variables interacts significantly with the credit rating (Column 4). Thus, both the ex ante terms and the ex post outcome are more strongly related to the bank's credit rating when our proxy for communication costs is low.

We have shown that the credit rating contains more information both after reform – when individual incentives are enhanced – and when the loan officer is closer to the ultimate decision authority within the branch. This seems consistent with the idea that total information production has improved. A skeptic might argue, however, that a more informative credit rating need not imply a more informed banker. Perhaps in the pre-reform years, bankers knew as much as before but simply failed to document that knowledge formally in a credit rating. To rule this out, our last test links the loan interest rate to default. If the bank really is better informed post-reform, then the interest rate ought to become a better predictor of default; if the bank really is better informed when the loan officer has worked with the branch president for many years, again the interest rate ought to predict default better as *time working together* increases.

Table 8, which reports estimates of equations (3a) and (3b), documents exactly these patterns. The marginal effect of the standardized interest rate on default more than doubles when comparing the pre-reform to the post-reform period (Columns 2 and 3 in Panel A; significant at 1% level). This effect is robust to adding firm controls and the nonpricing term of the loan (the interaction between post reform dummy and actual rate loses statistical significance in Columns 4 and 7). Focusing on the post-reform sample, we also find that the incremental effect of the interest rate strengthens with *time worked together* (Panel B). As in the earlier tables, however, neither the

loan officer's experience nor the branch president's experience interacts significantly with the loan interest rate. These results support our hypothesis that total information production and the lending process have improved after the reform and when the branch president and loan officer are more familiar with each other.

#### **IV. Conclusions**

In this paper we examine how banks with different organizational and incentive structures produce and process information in setting both price and non-price terms of loan contracts. We use data from China, where the banking sector has historically been dominated by large, inefficient state-owned banks with centralized decision making processes. Following China's entrance to the WTO in December 2001, however, many banks, and in particular, state-owned banks, implemented a series of reforms in 2002 focusing on decentralization—shifting responsibility for lending decisions to individual officers working in branches that directly process loan applications. We view these reforms as plausibly exogenous shocks from the perspective of lending officers charged with processing information.

We utilize detailed (proprietary) loan-level data from a large, nationwide state-owned bank that specify not only contract terms – interest rates and loan sizes – but also contains data on job histories of lending officers and branch president, the key decision maker over lending decisions over a sample of loans. Communication costs between the pair should drop when they have worked in the same branch for a longer period of time. We first show that incentives to produce information and communication costs affect how banks use information in setting loan contract terms. We then show that the information content embedded in both the credit rating *and* the ex ante loan interest rate become better predictors of loan performance after the reform and when communication costs are lower. These results matter to both the bank and borrowers because better

information, in turn, expands the supply of credit and improves (lending) outcomes.

Our results are of particular relevance for emerging economies that aim to develop their financial institutions. Reforming organizational structures and providing more incentives for loan officers can significantly improve the efficiency of financial institutions. Given the ‘populist’ demand for tighter regulations on financial institutions following the 2007-2009 global financial crisis, our results call for caution in excessive regulations as they may destroy the incentive structure to produce high-quality information, which is central in financial contracting and most business transactions.

## **Appendix A: How Are Internal Ratings Created? Two Case Studies**

### **Case 1:**

Company A, a state-owned company, has been in the copper industry for a long time. Facing increasingly fierce competition, the company's performance has been slipping since 2000: Sales and profits dropped and losses started to pile up, and so was its leverage level. For the past few years it had delayed repayments to several bank loans, losing its traditionally sound credit history and reputation. In 2005, Company A applies for a new loan (for restructuring efforts) and if loan officers were to base their (internal) ratings solely on publicly available information and the firm's recent track record, Company A would receive a very low rating and its application would probably be rejected.

The loan officers in charge of the rating, however, found out that Company B, through its holding company and/or one of its divisions, was in negotiations to help Company A's restructuring efforts (through the formation of a strategic alliance). After numerous investigations and discussions with various officials from Company A, the loan officers obtained detailed information on the proposed restructuring plan (with Company B's role) as well as its strategic growth plan post-restructuring. With this information (not public and not verifiable as neither Company A or B would publicly make any announcement), along with their own evaluation of Company A's new products and market share, the officers adjusted their initial rating, which helped Company A secure the new loan. Company A eventually repaid the new loan on time and regained its reputable credit record.

### **Case 2:**

Company C, a large textile company in its region and partially owned by the local government, has been struggling due to weakening demand of its products. Its financial conditions also worsened and the company seeks a new loan from the bank to secure liquidity and working capital needs. The company's executives lobbied various government officials to help 'strengthen' its relationship with the bank, as these executives were aware that it is unlikely that they will be able to convince the loan officers of their current credit worthiness. Given the strategic importance of the company, several officials did put in personal efforts in trying to convince the senior officials of the bank branch that handled the loan application.

The bank branch does not always have the final say in cases of approving loans from 'risky' or questionable borrowers, rather the larger branch in the state capital (higher ranked along the hierarchy chain) does. However, since most of the interactions (e.g., loan applications and post-loan monitoring) with borrower companies take place in smaller branches throughout the state, it is important to have the support of government officials in the smaller cities and counties where the direct lending activities occur. Moreover, many city and county governments have considerable budget surpluses and there is fierce competition among all financial institutions to win over (the depository services) the 'special' customers.

Perhaps due to the persistent persuasions and pressure from local government officials, the loan officers in charge of the internal risk assessment of the loan (at the local branch) assigned a favorable rating to Company C, and this rating also helped to pave the way for the approval of the loan from the superior branch. However, Company C's fortune did not turn around and defaulted on the loan.

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**Table 1: Summary Statistics on Firms and Loans**

The sample data is from January 14, 2000 to December 31, 2006, with April 17, 2002 as the starting point for the policy reform. Pre-reform period indicates 01/14/2000 to 4/16/2002, and Post-reform period indicates 1/1/2004 to 12/31/2006; we drop loans originated between 4/17/2002 and 2/31/2003. Internal credit ratings range from 1 to 8, with a higher score indicating a borrower with higher credit quality. In Panel B, ‘standardized interest rate 1’ is the interest rate on a loan over the standard deviation of rates in the same year; ‘standardized interest rate 2’ on a loan originated in the pre-reform (post-reform) period is the actual rate over the standard deviation of all the rates in the pre-reform (post-reform) period.

<b>Panel A: Borrower Firms Characteristics</b>			
<b>Variable</b>		<b>Pre Reform</b>	<b>Post Reform</b>
<b>Number of Loans</b>		3,665	33,996
<b>Number of Firms</b>		1,733	5,929
<b>Firm Asset</b>	Max	10,100.00	37,600.00
<b>(Million RMB)</b>	Min	0.60	0.27
	Mean	201.00	354.00
<b>Leverage</b>	Max	0.99	0.99
	Min	0.01	0.01
	Mean	0.52	0.45
<b>ROA</b>	Max	0.59	0.64
	Min	-0.44	-0.35
	Mean	0.06	0.09
<b>Credit Rating</b>	Max	8	8
<b>(From 1 to 8)</b>	Min	1	1
	Mean	5.45	5.29
<b>Firm Type</b>	State-owned	1,042	4,101
	Private-owned	743	12,764
	Others	1,880	17,131
<b>Industry</b>	Agriculture	521	2,580
	Manufacturing	1,742	18,513
	Construction	70	706
	Utility	21	140
	Retailing	485	7,056
	Others	826	5,001

<b>Panel B: Terms of Loan Contracts</b>			
<b>Variable</b>		<b>Pre Reform</b>	<b>Post Reform</b>
<b>Actual interest rate (%)</b>	Max	8.42	11.63
	Min	4.94	4.54
	Mean	7.00	6.89
	Std. dev.	0.59	0.98
<b>Standardized interest rate 1 (%)</b>	Max	16.87	12.43
	Min	8.61	4.37
	Mean	12.99	7.47
<b>Standardized interest rate 2 (%)</b>	Max	14.20	11.92
	Min	8.33	4.65
	Mean	11.80	7.06
<b>Loan size (million RMB)</b>	Max	200.00	395.00
	Min	0.51	0.50
	Mean	4.13	6.63

<b>Panel C: Working Experience (in years; post-reform period only)</b>						
<b>Variables</b>	<b>Obs.</b>	<b>Std. dev.</b>	<b>Median</b>	<b>Mean</b>	<b>Min</b>	<b>Max</b>
<b>Single loan officer's experience</b>	2,597	1.63	3.72	3.47	0.32	10.28
<b>Bank branch president's experience</b>	2,597	4.27	4.16	5.57	1.02	26.52
<b>Time worked together</b>	2,597	1.40	1.58	1.69	0.00	6.91

**Table 2: Regression of Credit Ratings on Hard Information Variables**

We report OLS regression results of internal ratings on hard information variables for both the pre-reform and post-reform periods. The SOE dummy equals 1 when the borrower is a state-owned enterprise, and 0 otherwise (“other ownership types” are the default type). Previous default record dummy equals 1 when the borrower has defaulted on a loan during the 12 months prior to the application of the current loan, and 0 otherwise. Standard errors are clustered by borrower firms.

<b>Independent variables</b>	<b>Pre Reform</b>	<b>Post Reform</b>	<b>Pre Reform</b>	<b>Post Reform</b>
	Credit Rating	Credit Rating	Credit Rating	Credit Rating
	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)
<b>Log asset</b>	<b>0.087</b> <b>(0.013)</b>	<b>0.409</b> <b>(0.000)</b>	<b>0.092</b> <b>(0.037)</b>	<b>0.360</b> <b>(0.000)</b>
<b>Leverage</b>	<b>-1.293</b> <b>(0.000)</b>	<b>-1.578</b> <b>(0.000)</b>	<b>-1.412</b> <b>(0.000)</b>	<b>-1.797</b> <b>(0.000)</b>
<b>ROA</b>	<b>1.728</b> <b>(0.031)</b>	<b>3.601</b> <b>(0.000)</b>	<b>1.764</b> <b>(0.040)</b>	<b>3.675</b> <b>(0.000)</b>
<b>SOE</b>	-0.202 (0.148)	<b>-0.445</b> <b>(0.000)</b>	<b>-0.572</b> <b>(0.000)</b>	<b>-0.818</b> <b>(0.000)</b>
<b>Private</b>	-0.017 (0.886)	<b>0.253</b> <b>(0.000)</b>	-0.020 (0.886)	<b>0.168</b> <b>(0.000)</b>
<b>Previous default record</b>	<b>0.227</b> <b>(0.088)</b>	<b>-0.381</b> <b>(0.000)</b>	<b>0.403</b> <b>(0.010)</b>	<b>-0.449</b> <b>(0.000)</b>
<b>Total Asset Turnover</b>	<b>0.080</b> <b>(0.030)</b>	<b>0.044</b> <b>(0.093)</b>	<b>0.146</b> <b>(0.000)</b>	0.024 (0.270)
<b>Industry dummies</b>	Yes	Yes	No	No
<b>Year dummies</b>	Yes	Yes	No	No
<b>City dummies</b>	Yes	Yes	No	No
<b>Observations</b>	3,665	33,996	3,665	33,996
<b>R Squared</b>	0.3853	0.3930	0.0849	0.2437
<b>Adjusted R Squared</b>	0.3775	0.3922	0.0831	0.2435

P-values appear below coefficient

**Table 3: Regression of Ex Ante Loan Terms Credit Rating: Pre v Post-Reform**

We report OLS regression results of loan terms (actual interest rate, standardized interest rate 1, standardized interest rate 2 and log of loan size) on credit rating and interaction with post reform dummy. The standardized interest rate 1 is the interest rate over standard deviation of every single year's loans' interest; standardized interest rate 2 is the interest rate over standard deviation of pre-/post- reform period loans' interest. The Post-reform dummy equals 1 when the loan is made after the reform (post-2003). Firm controls and interactions include financial variables (firm size, leverage, ROA), ownership types (SOE), previous default record, total asset turnover ratio and the interactions between post-reform indicator and financial variables. Standard errors are clustered by borrower firms.

Independent Variables	Actual	Std.	Std.	Log
	interest rate	interest rate 1	interest rate 2	loan size
	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)
<b>Credit rating</b>	0.005 (0.667)	0.012 (0.431)	0.009 (0.522)	-0.016 (0.152)
<b>Post*credit rating</b>	<b>-0.071</b> <b>(0.000)</b>	<b>-0.083</b> <b>(0.000)</b>	<b>-0.080</b> <b>(0.000)</b>	<b>0.024</b> <b>(0.069)</b>
<b>Log asset</b>	<b>-0.072</b> <b>(0.000)</b>	<b>-0.172</b> <b>(0.000)</b>	<b>-0.152</b> <b>(0.000)</b>	<b>0.410</b> <b>(0.000)</b>
<b>Leverage</b>	<b>-0.220</b> <b>(0.023)</b>	<b>-0.326</b> <b>(0.032)</b>	<b>-0.299</b> <b>(0.032)</b>	0.029 (0.795)
<b>ROA</b>	-0.230 (0.337)	-0.355 (0.334)	-0.347 (0.300)	0.438 (0.191)
<b>SOE</b>	<b>-0.113</b> <b>(0.027)</b>	<b>-0.203</b> <b>(0.007)</b>	<b>-0.186</b> <b>(0.008)</b>	<b>-0.115</b> <b>(0.015)</b>
<b>Private</b>	0.010 (0.808)	0.084 (0.155)	0.071 (0.195)	<b>-0.121</b> <b>(0.003)</b>
<b>Previous default record</b>	<b>0.300</b> <b>(0.000)</b>	<b>0.248</b> <b>(0.001)</b>	<b>0.254</b> <b>(0.000)</b>	-0.053 (0.206)
<b>Total asset turnover</b>	-0.016 (0.198)	<b>-0.034</b> <b>(0.069)</b>	<b>-0.030</b> <b>(0.082)</b>	<b>0.037</b> <b>(0.004)</b>
<b>Post*firm controls</b>	Yes	Yes	Yes	Yes
<b>Year dummies</b>	Yes	Yes	Yes	Yes
<b>City dummies</b>	Yes	Yes	Yes	Yes
<b>Industry dummies</b>	Yes	Yes	Yes	Yes
<b>Observations</b>	37,661	37,661	37,661	37,661
<b>R Squared</b>	0.5511	0.8877	0.8484	0.5411
<b>Adjusted R Squared</b>	0.5504	0.8875	0.8482	0.5404

P-values appear below coefficient

**Table 4: Correlations between Work Experience and Borrower Characteristics**

This table reports simple correlations between loan officer experiences, branch president experience, the time the two have worked together in the same branch with borrower characteristics and credit ratings. The sample is 2,009 loans from the post-reform period.

	<b>Log Asset</b>	<b>Leverage</b>	<b>ROA</b>	<b>SOE</b>	<b>Private</b>	<b>Default Record</b>	<b>Total Asset Turnover</b>	<b>Credit Rating</b>
<b>Loan Officer's working experience</b>	-0.057	0.011	0.030	0.012	-0.018	-0.045	-0.041	0.045
<b>Branch President's working experience</b>	-0.250	-0.118	0.201	-0.117	0.109	-0.156	0.089	-0.098
<b>Time Worked together</b>	-0.078	-0.043	0.040	0.013	-0.015	-0.109	-0.047	0.083

**Table 5: Regression of Ex Ante Loan Terms on Credit Rating: The Effect of Communication Cost in the Post-Reform Sample**

We report regression (OLS) results of loan terms (actual interest rate, standardized interest 1, standardized interest 2 and log of loan size) on credit rating and interactions with loan officer experience (in years), branch president experience (in years) and time worked together of loan officer and president (in years). Sample includes just the post-reform period. The standardized interest rate 1 is the interest rate over standard deviation of every single year's loans' interest; standardized interest rate 2 is the interest rate over standard deviation of pre-/post- reform period loans' interest. Standard errors are clustered by borrower firms. P-values appear below coefficient.

Independent Variables	Actual	Std.	Std.	Ln Loan	Actual	Std.	Std.	Ln Loan	Actual	Std.	Std.	Ln Loan
	Rate	Rate 1	Rate 2	Size	Rate	Rate 1	Rate 2	Size	Rate	Rate 1	Rate 2	Size
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<b>Credit Rating</b>	<b>-0.092</b>	<b>-0.089</b>	<b>-0.094</b>	0.005	<b>-0.041</b>	<b>-0.040</b>	<b>-0.042</b>	-0.039	-0.008	-0.004	-0.008	-0.002
	<b>(0.000)</b>	<b>(0.000)</b>	<b>(0.000)</b>	(0.803)	<b>(0.077)</b>	<b>(0.083)</b>	<b>(0.077)</b>	(0.116)	(0.843)	(0.924)	(0.843)	(0.960)
<b>Time worked together*Rating</b>	-	-	-	-	<b>-0.031</b>	<b>-0.030</b>	<b>-0.031</b>	<b>0.027</b>	<b>-0.027</b>	<b>-0.026</b>	<b>-0.027</b>	<b>0.036</b>
	-	-	-	-	<b>(0.010)</b>	<b>(0.009)</b>	<b>(0.010)</b>	<b>(0.003)</b>	<b>(0.055)</b>	<b>(0.052)</b>	<b>(0.055)</b>	<b>(0.011)</b>
<b>Officer Experience*Rating</b>	-	-	-	-	-	-	-	-	-0.001	-0.001	-0.001	-0.009
	-	-	-	-	-	-	-	-	(0.892)	(0.926)	(0.892)	(0.446)
<b>President Experience*Rating</b>	-	-	-	-	-	-	-	-	-0.006	-0.007	-0.006	-0.004
	-	-	-	-	-	-	-	-	(0.186)	(0.130)	(0.186)	(0.306)
<b>Time worked together</b>	<b>-0.083</b>	<b>-0.077</b>	<b>-0.085</b>	0.007	0.074	0.076	0.076	<b>-0.130</b>	0.055	0.058	0.056	<b>-0.179</b>
	<b>(0.003)</b>	<b>(0.004)</b>	<b>(0.003)</b>	(0.771)	(0.242)	(0.213)	(0.242)	<b>(0.012)</b>	(0.467)	(0.429)	(0.467)	<b>(0.019)</b>
<b>Officer Work Experience</b>	-0.025	-0.024	-0.026	0.001	-0.022	-0.021	-0.023	-0.001	-0.014	-0.015	-0.014	0.048
	(0.152)	(0.159)	(0.152)	(0.937)	(0.197)	(0.205)	(0.197)	(0.965)	(0.809)	(0.787)	(0.809)	(0.451)
<b>President Work Experience</b>	-0.008	-0.008	-0.009	0.009	-0.008	-0.008	-0.008	0.009	0.024	0.028	0.025	0.029
	(0.372)	(0.369)	(0.372)	(0.297)	(0.385)	(0.382)	(0.385)	(0.303)	(0.318)	(0.233)	(0.318)	(0.131)
<b>Year dummies</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>City dummies</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Industry dummies</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Firm controls</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	2,597	2,597	2,597	2,597	2,597	2,597	2,597	2,597	2,597	2,597	2,597	2,597
<b>R Squared</b>	0.5115	0.6315	0.5115	0.5617	0.5157	0.6347	0.5157	0.5638	0.5171	0.6362	0.5171	0.5644
<b>Adjusted R Squared</b>	0.5021	0.6244	0.5021	0.5532	0.5062	0.6276	0.5062	0.5552	0.5073	0.6287	0.5073	0.5555

**Table 6: Summary Statistics on Ex Post Loan Performance**

This table reports the simple default statistics sorted by internal credit ratings, divided into pre- and post-reform regimes (Panel A), and, for the post-reform regime, based on the sorting of time working together for a pair of loan officer and bank branch president (Panel B). “Pay off on time” means the borrower pays off the entire loan on or before the maturity date, otherwise the borrower is in some kind of default state (3 cases), using one year after the original loan maturity date as the cutoff date for (late) repayment.

		Pre reform (before 2003)								Post reform (after 2003)							
Credit Ratings		1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
<b>Breach of contract (%)</b>	Didn't repay	0	-	0.6	0.7	0	0.6	0.4	2.3	1.1	1.4	1.3	2.3	1.7	1.9	1.3	0
	Partial repay	75	-	31.9	37.7	42.8	46.4	38.3	31.1	24.7	29	24	16.4	11.4	5.7	3.3	0
	Pay off late	25	-	9.9	8.8	7.9	6.3	5.3	4.9	2.1	2.5	1.9	1.1	0.7	0.3	0.3	0
<b>Contracts performance (%)</b>	Pay off on time	0	-	57.7	52.8	49.3	46.7	56.1	61.7	72.1	67	72.8	80.3	86.1	92.2	95.2	100
<b>Number of loans</b>		4	0	912	422	229	685	1,024	389	753	1,071	3,210	2,364	10,845	7,160	8,077	525

**Table 7: Regression of Ex Post Loan Outcomes on Credit Rating:  
Pre v. Post-Reform and Effects of Communication Cost in the Post-Reform Sample**

In column 1, we report marginal effects from Probit regression results (coefficients) of loan performance outcomes on the credit rating, and its interaction with a post-reform indicator. In column 2 through column 4, we report marginal effects from Probit regressions of loan performance outcomes on the credit rating, and its interaction with loan officer experience (in years), branch president experience (in years) and time working together of loan officer and president (in years). Firm controls include financial variables (firm size, leverage, ROA), ownership types (SOE), previous default record, total asset turnover ratio. The dependent variable equals 1 if a loan is paid in full at the maturity date and 0 otherwise. Standard errors are clustered by borrower firms.

Independent Variables	Loan Outcome	Loan Outcome		
	(Pre vs. Post Reform)	(Post-reform only)		
	Probit	Probit	Probit	Probit
	(1)	(2)	(3)	(4)
<b>Credit rating</b>	<b>0.007</b>	<b>0.028</b>	<b>0.017</b>	<b>0.024</b>
	<b>(0.088)</b>	<b>(0.000)</b>	<b>(0.020)</b>	<b>(0.033)</b>
<b>Post*Credit rating</b>	<b>0.025</b>	-	-	-
	<b>(0.000)</b>	-	-	-
<b>Time worked together</b>	-	<b>0.019</b>	-0.017	-0.017
	-	<b>(0.012)</b>	(0.314)	(0.384)
<b>Loan officer's working experience</b>	-	-0.006	-0.006	-0.007
	-	(0.219)	(0.205)	(0.662)
<b>Bank president's working experience</b>	-	<b>-0.007</b>	<b>-0.007</b>	-0.000
	-	<b>(0.000)</b>	<b>(0.000)</b>	(0.952)
<b>Time worked together*Rating</b>	-	-	<b>0.007</b>	<b>0.008</b>
	-	-	<b>(0.020)</b>	<b>(0.049)</b>
<b>Loan officer's experience*Rating</b>	-	-	-	0.000
	-	-	-	(0.921)
<b>Bank president's experience*Rating</b>	-	-	-	-0.001
	-	-	-	(0.162)
<b>Firm controls</b>	Yes	Yes	Yes	Yes
<b>Post*firm controls</b>	Yes	-	-	-
<b>Year dummies</b>	Yes	Yes	Yes	Yes
<b>City dummies</b>	Yes	Yes	Yes	Yes
<b>Industry dummies</b>	Yes	Yes	Yes	Yes
<b>Observations</b>	37,661	2,416	2,416	2,416
<b>Pseudo R Squared</b>	0.1910	0.1823	0.1865	0.1881

P-values appear below coefficient





<b>City dummies</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Industry dummies</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Firm controls</b>	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>Post*firm controls</b>	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	37,661	37,661	37,661	37,661	37,661	37,661	37,661	37,661	37,661
<b>Pseudo R Squared</b>	0.1239	0.1254	0.1239	0.1797	0.1803	0.1797	0.1840	0.1846	0.1840

**Table 8, Panel B: Regression of Loans Outcome on Ex Ante Loan Terms, and The Effect of Communication Cost in the Post-Reform Sample**

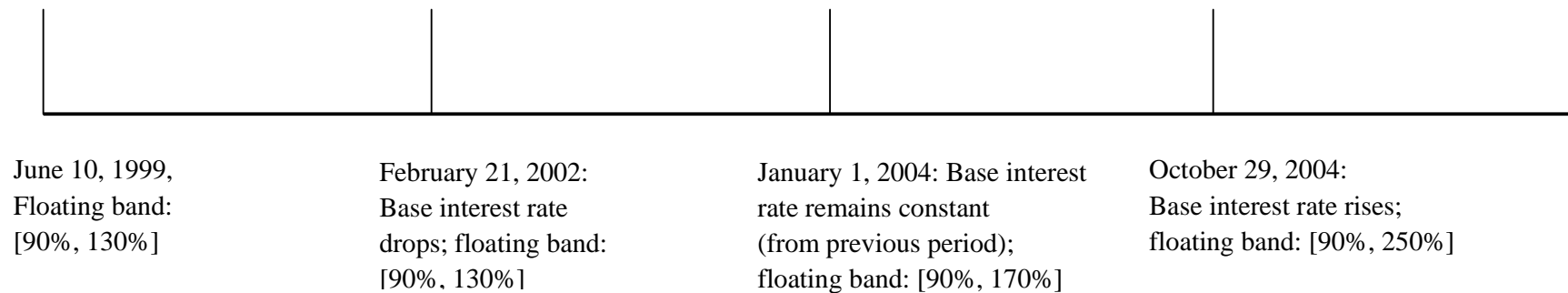
We report marginal effects from Probit regressions of loans outcome on interest rate (actual interest rate, standardized interest 1, standardized interest 2) and integration with loan officer's working experience, bank branch president's working experience and time working together for a pair of loan officer and bank president (in years). The dependent variable equals 1 if a loan is paid in full at the maturity date and 0 otherwise. The standardized interest rate 1 is the interest rate over standard deviation of every single year's loans' interest; standardized interest rate 2 is the interest rate over standard deviation of pre-/post- reform period loans' interest. Standard errors are clustered by borrower firms. P-values appear below coefficient.

<b>Independent Variables</b>	<b>Loans</b>	<b>Loans</b>	<b>Loans</b>	<b>Loans</b>	<b>Loans</b>	<b>Loans</b>	<b>Loans</b>	<b>Loans</b>	<b>Loans</b>
	<b>outcome</b>	<b>outcome</b>	<b>outcome</b>	<b>outcome</b>	<b>outcome</b>	<b>outcome</b>	<b>outcome</b>	<b>outcome</b>	<b>outcome</b>
	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit	Probit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<b>Actual Rate</b>	<b>-0.062</b>	-	-	-0.027	-	-	<b>-0.045</b>	-	-
	<b>(0.000)</b>	-	-	(0.117)	-	-	<b>(0.062)</b>	-	-
<b>Std. Rate 1</b>	-	<b>-0.063</b>	-	-	<b>-0.039</b>	-	-	<b>-0.040</b>	-
	-	<b>(0.000)</b>	-	-	<b>(0.013)</b>	-	-	<b>(0.071)</b>	-
<b>Std. Rate 2</b>	-	-	<b>-0.061</b>	-	-	-0.027	-	-	<b>-0.044</b>
	-	-	<b>(0.000)</b>	-	-	(0.117)	-	-	<b>(0.062)</b>
<b>Actual Rate*Time together</b>	-	-	-	<b>-0.019</b>	-	-	<b>-0.024</b>	-	-
	-	-	-	<b>(0.007)</b>	-	-	<b>(0.006)</b>	-	-
<b>Std. Rate1*Time together</b>	-	-	-	-	<b>-0.013</b>	-	-	<b>-0.013</b>	-
	-	-	-	-	<b>(0.022)</b>	-	-	<b>(0.059)</b>	-

<b>Std. Rate2*Time together</b>	-	-	-	-	-	<b>-0.018</b>	-	-	<b>-0.023</b>
	-	-	-	-	-	<b>(0.007)</b>	-	-	<b>(0.006)</b>
<b>Actual Rate*Officer Exp.</b>	-	-	-	-	-	-	0.004	-	-
	-	-	-	-	-	-	(0.477)	-	-
<b>Actual Rate*President Exp.</b>	-	-	-	-	-	-	0.002	-	-
	-	-	-	-	-	-	(0.350)	-	-
<b>Std.Rate1*Officer Exp.</b>	-	-	-	-	-	-	-	-0.004	-
	-	-	-	-	-	-	-	(0.469)	-
<b>Std.Rate1*President Exp.</b>	-	-	-	-	-	-	-	0.002	-
	-	-	-	-	-	-	-	(0.133)	-
<b>Std.Rate2*Officer Exp.</b>	-	-	-	-	-	-	-	-	0.004
	-	-	-	-	-	-	-	-	(0.477)
<b>Std.Rate2*President Exp.</b>	-	-	-	-	-	-	-	-	0.001
	-	-	-	-	-	-	-	-	(0.350)
<b>Time Worked Together</b>	<b>0.012</b>	<b>0.012</b>	<b>0.012</b>	<b>0.142</b>	<b>0.098</b>	<b>0.142</b>	<b>0.174</b>	<b>0.102</b>	<b>0.174</b>
	<b>(0.096)</b>	<b>(0.083)</b>	<b>(0.096)</b>	<b>(0.004)</b>	<b>(0.009)</b>	<b>(0.004)</b>	<b>(0.003)</b>	<b>(0.026)</b>	<b>(0.003)</b>
<b>Officer Experience</b>	-0.004	-0.004	-0.004	-0.004	-0.004	-0.004	-0.033	0.021	-0.033
	(0.331)	(0.324)	(0.331)	(0.388)	(0.375)	(0.388)	(0.415)	(0.552)	(0.415)
<b>President Experience</b>	<b>-0.006</b>	<b>-0.006</b>	<b>-0.006</b>	<b>-0.006</b>	<b>-0.006</b>	<b>-0.006</b>	-0.017	<b>-0.022</b>	-0.017
	<b>(0.001)</b>	<b>(0.001)</b>	<b>(0.001)</b>	<b>(0.001)</b>	<b>(0.001)</b>	<b>(0.001)</b>	(0.141)	<b>(0.038)</b>	(0.141)
<b>Year dummies</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>City dummies</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Industry dummies</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Firm controls</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Observations</b>	2,416	2,416	2,416	2,416	2,416	2,416	2,416	2,416	2,416
<b>Pseudo R Squared</b>	0.1934	0.1913	0.1934	0.2009	0.1958	0.2009	0.2019	0.1980	0.2019

### Figure 1 (Regulated) Interest Rate Movements

Below is the timeline of changes in regulations on loan interest rates (base rates and upper and lower bounds) from June 10, 1999 to December 31, 2005 in China. Floating band indicates the range in which interest rates can fluctuate (e.g., set by lenders) from the base rate: for example, a floating band [90%, 130%] means that the lowest possible rate is 90% of the base rate while the highest rate is 130% of the base rate. Base rates are time varying (regulation changes) and depend on loan maturities. Source: People's Bank of China, *Almanac of China's Finance and Banking* (2000-2008)



**Figure 2: Distributions of Actual Internal Ratings**

We plot the histograms of *actual* credit internal ratings on loans during the pre-2003 (before reform) and post-2003 (after reform) periods. There are 3,665 loans in the pre-2003 sample and 34,124 loans in the post-2003 sample. Internal ratings range from 1 to 8; higher ratings indicating higher credit quality.

