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

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ABSTRACT

In 2002 and 2003, many Chinese banks implemented reforms that delegated authority to individual loan officers. The change followed China's entrance into the WTO and offers a plausibly exogenous shock to loan officer incentives to produce information. We find that the bank's internal risk rating becomes a stronger predictor of loan interest rates and ex post outcomes after reform. When the loan officer and the branch president who approves the loan work together longer, the rating also becomes more strongly related to loan prices and outcomes. Our results highlight how incentives and communication costs affect information production and use.

HIGH-QUALITY INFORMATION is essential for successful business transactions. A growing literature emphasizes how both individual incentives and the cost of communication to decision-making authorities affect the production and use of information. In this paper, we study how banks use information to set loan interest rates, how that information forecasts future outcomes (default), and how the quality (predictive power) of information production varies with incentives and communication costs.

We use data from China, which historically has been dominated by large and inefficient state-owned banks that rely on centralized decision-making processes. Following China's entrance into the World Trade Organization (WTO) in

December 2001, however, many 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 individuals.[1] These reforms strengthened incentives for loan officers to produce and banks to use high-quality information, yet they are plausibly exogenous from the perspective of loan officers because the reforms came from the highest level due to external pressure.

We exploit proprietary loan-level data from a large, nationwide state-owned bank that provides information on both interest rates and outcomes (full repayment on time, partial or late repayment, total loss). We test how incentives to produce and use information affect, first, how banks set ex ante loan pricing based on that information, and, second, how well that information forecasts future loan performance. We then test how communication costs affect information production and use, where costs are proxied by the time the information producer (loan officer) and final decision maker (branch president) have worked in the same branch.

Our sample covers borrowers located in more than 30 cities across China over the 2000 to 2006 period. We treat the first half of 2002 and earlier as the pre-reform period, and 2004 and later as the post-reform period. The key information measure is the bank's internally generated credit rating, which measures the bank's assessment of 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 the first part of our analysis, we test the theoretical prediction that increasing the authority and accountability of individual loan officers strengthens their incentive to produce high-quality information, and such information is given a more prominent role in the decision process (e.g., Aghion and Tirole (1997)). We find that the bank places more weight on the credit rating in setting loan terms after reform, conditional on borrower characteristics. Furthermore, a better credit rating leads to a greater reduction in interest rates in the post-reform period. These effects are stronger in coastal provinces, where the incentives for loan officers to produce and branches to use high-quality information are greatest. We next show that the information content embedded in the credit rating and interest rate improves after reform—both become better predictors of loan default. Thus, with better incentives the bank impounds better information into loan interest rates, which in turn leads to interest rates' greater power to predict future default. These results are robust to the inclusion of local banking sector competitiveness as well as the strength of past lending relationships with the borrowers.

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[1] The four largest state-owned banks have become publicly listed and traded on both domestic and Hong Kong exchanges, with various government agencies retaining majority (equity) control. These banks are currently among the largest banks in the world (source: Bloomberg). See, for example, Allen et al. (2012) for more details.

In our second set of tests, we consider the effects of communication costs on information production and use. 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 communication is 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 we argue that, when the loan officer and the head of the same bank branch (a key actor in loan approval) have worked together longer, communication costs should be lower. Familiarity per se does not guarantee better information—for example, a branch president/loan officer pair who has worked together for an extended period may be more likely to collude and favor questionable borrowers. In this regard, it is important to note that we conduct these second set of tests on the post-reform data. Because reform led to improved loan officer incentives, we expect a *positive* incremental effect of time worked together between a loan officer/branch head pair on information production as a result of lower communication costs.

As with reform, we find that the bank places greater weight on the credit rating as the time worked together between a loan officer/branch head pair increases. Moreover, we find that both the internal credit rating and the interest rate better predict loan outcomes as the length of time between a pair increases. We consider the possibility that these results reflect a spurious correlation between loan officer quality and the length of the collaboration with the president (e.g., low-quality officers may be more likely to be dismissed). The result is robust, however, to controlling for both loan officer experience and past performance, as well as for the branch president's experience. In our view adding these controls helps rule out endogenous matching as an explanation for our findings, but we admit that we have no plausibly exogenous instrument to fully resolve this concern. Nevertheless, the results support the idea that lower communication costs improve both the quality of information production and how that information is used.

Our paper contributes to and extends the literature on the role of information in financial contracting. Despite ample theoretical work, there is 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 the difficulty in finding measures of communication costs that can be converted into quantitative variables, as well as measures of outcomes to assess the quality of information produced. Our results, based on an exogenous shock to the banking sector, detailed loan-level data including both the terms and outcomes of loans, as well as job-related histories of loan officers and branch presidents, highlight the importance of incentive structures and communication costs for the production, transmission, and use of information. Better information, we find, expands the supply of credit and improves (lending) outcomes.

A few recent empirical studies in banking explore information production and usage, but are unable to exploit plausibly exogenous variation such as the

policy innovation in China, as in our context.[2] Based on a loan officer rotation program from one Argentine bank, Hertzberg, Liberti, and Paravisini (2010) find that internal ratings from loan officers anticipating rotation are better predictors of default, because these officers have a stronger incentive to report bad news on the borrowers.[3] Our tests are based on an exogenous policy shock to incentives within the same bank and a direct measure of communication costs between the loan officer and branch president. Moreover, we examine the effects of internal ratings on loan interest rates, and the effects of both the ratings and interest rates on loan outcomes. Other papers find that physical distance between lenders and borrowers adversely affects the quality of information (e.g., Petersen and Rajan (2002), Degryse and Ongena (2005), Alessandrini, Presbitero, and Zazzaro (2009), Agarwal and Hauswald (2010a)). 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.[4]

The rest of the paper is organized as follows. In Section I, we describe China's banking sector including the lending process, 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 II, we describe our sample of bank loans and present the empirical tests and results. Section III concludes. The Appendix contains case studies on how credit ratings are created.

I. Institutional Environment, Related Literature, and Hypotheses

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

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[2] For example, Berger et al. (2005) find that small U.S. banks provide stronger incentives for investment in soft information than large banks, whereas Degryse, Laeven, and Ongena (2009) find that banks' organizational structure affects rivals' loan pricing strategies and geographical reach.

[3] Liberti and Mian (2009) explore how hierarchies within one bank affect the use of information in determining credit limits, Mian (2006) shows that domestic banks tend to invest more in relationships, and Liberti (2004) exploits how a change in incentives affects loan officers' effort to invest in soft information. In addition, Brown et al. (2012) examine loan officers' incentives to smooth credit ratings across multiple banks that use the same model.

[4] 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 (not reported) due in part to extensive branching throughout the country by all major Chinese banks.

A. Overview of China's Banking Sector

The banking system has played an important role in the growth of China's economy, which is now the second largest in the world (Allen, Qian, and Qian (2005)). The four largest, state-owned commercial banks have a nationwide network of branches and control the majority of assets, although their dominant status has weakened in recent years with the entry of many domestic and foreign banking institutions.

The most glaring problem facing the banking sector had been high non-performing loans (NPLs). Following the Asian financial crisis in 1997, China began to focus on improving the efficiency of its state-owned banks, so that these banks would behave more like profit-maximizers. As a result, all of the Big Four state-owned banks have become publicly listed and traded (on both domestic and Hong Kong exchanges), with the government retaining majority control through holdings of large equity blocks. Given their prudent investment approaches, these banks have not been severely affected by the 2007 to 2009 global financial crisis, and are currently among the largest in the world.

China's banking sector, together with other sectors of strategic importance, has been under intensive monitoring by the government, mainly through its central bank (People's Bank of China, PBOC) and the China Banking Regulatory Commission (CBRC). PBOC limits the movements of interest rates on both deposits and loans by setting base rates along with upper and lower bounds. These rates and bounds vary over business cycles and with loan maturities. 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). In results reported in the Internet Appendix,[5] we also estimate models that do not include loans priced at the upper and lower bounds (less than 10% of the sample), and find that the results are similar to those reported below.[6]

China's entry into the WTO in December 2001 marked a new phase of its integration into global markets—all member countries of the WTO must (eventually) open up domestic markets and allow capital flows. In anticipation of more competition from foreign financial institutions, many Chinese banks, especially those owned by the government, began implementing reforms during the second half of 2002. These reforms were not triggered by any specific problem but rather aimed to improve the competitiveness of all large state-owned banks ahead of pending foreign competition.[7] Therefore, these reforms

[5] The Internet Appendix may be found in the online version of this article.

[6] In earlier drafts we also explored loan size as an additional outcome, with evidence that the credit rating becomes more closely tied to loan size after reform (see the Internet Appendix), consistent with the results for loan interest rates. Other loan terms such as maturity could also be affected by reform, so we estimate our models with loan maturity as an additional control (reported in the Internet Appendix). We find that adding this effect has very little impact on our results. This may be due to the fact that most of the loans in our sample have maturity less than one year, so there is little variation along this margin.

[7] The growth of financial institutions outside the Big Four banks is visible in the data. In 2001, total assets, deposits, and loans of all "other commercial banks," where joined ownerships are forged between investors and local governments, and foreign banks are about a quarter of those of

provide a plausibly exogenous shock to the banking sector, particularly from the perspective of the loan officers at different branches across the country.

One of the central themes in this round of reforms has been decentralization—imposing greater responsibilities on individual loan officers in charge of different steps in the lending process. Under the old regime, each step of the lending process was conducted without a clear designation of individual responsibilities. With "group" responsibility at each step, individual officers lacked the incentive to perform their tasks. Under the new regime, each of the five lending subgroups or divisions within a branch has clearly defined roles: (initial) investigation, verification, deliberation and discussion, approval, and post-loan monitoring. Individual officers must sign off on reports produced at each step. In particular, loan officers from the investigation unit are responsible for internal ratings and can be held liable for bad loans extended based on inaccurate ratings. We test the strength of this link by examining the relationship between loan officers' past performance in terms of the outcome of loans processed and their promotion in the post-reform period.

Although delegation of responsibilities aims to improve the efficiency of the lending process by increasing incentives to exert effort, approval of the final loan contract is left to a committee (through voting) of senior officials of the branch. This committee is chaired by the bank branch president and has at least one official *not* involved with any of the earlier steps of the lending process. This approach avoids granting excessive power to one or a few individual officers.

After origination, the bank enters the post-loan management phase, actively monitoring the borrower and continuing to reassess (repayment) risk. If a firm defaults, the bank typically (privately) works out a restructuring plan. The bank can also take a number of other actions, for example, it can take ownership of collateral, ask the guarantor(s) (individuals, firms, or other entities) of the loan to repay, or take the firm to court. In some cases, involving a defaulted state-owned firm/borrower, the government may step in and (partially) repay the bank.[8] Accordingly, in our empirical tests we distinguish whether borrowers are ultimately owned by the state.

B. Theoretical Background and Hypotheses on Information Production and Contracting

Theoretical work examines two related aspects of information production, transmission, and usage (see Petersen (2004) for a review). First, individuals with more authority and responsibilities have stronger incentives to produce high-quality information (see, e.g., Agarwal and Hauswald (2010b) for

the Big Four banks; in 2008, the scale of these institutions had risen to more than half of the Big Four banks (Allen et al. (2012)).

[8] China enacted a new bankruptcy law in August 2006 (effective June 1, 2007). In many respects, the new law resembles bankruptcy laws in developed countries such as the United Kingdom. For example, it introduces an independent bankruptcy administrator, who manages the assets of the debtor after the court has accepted the bankruptcy filing. Despite the legal procedures specified by the law, enforcement of the law remains weak and inconsistent.

empirical evidence). Second, it takes time and effort for an agent to absorb new information sent by others and different agents may have biases or different preferences when sending and interpreting information, that is, there are frictions in the communication and decision-making processes (e.g., Crawford and Sobel (1982), Radner (1993), Bolton and Dewatripont (1994), Garicano (2000), Dewatripont and Tirole (2005)). More recent literature (e.g., Dessein (2002), Harris and Raviv (2005, 2008), Chakraborty and Yilmaz (2011), Malenko (2014)) studies the cost of communications within a group including an informed agent, whose incentives may not be aligned with those of the principal—for instance, the CEO's incentives may not be aligned with those of the firm's board of directors. The main trade-off is that too much delegation of responsibility to the informed agent can result in information manipulation and suboptimal decisions, whereas too little delegation can result in the loss of valuable information.

Testing these theories has been challenging. First, finding plausibly exogenous variation in incentive structures is a necessary condition to draw clear inferences but has been difficult to achieve. Second, empirical measures of communication costs that can be converted into quantitative variables are difficult to come by, as are measures of communications outcomes. For example, in the case of corporate governance, it is difficult to link the outcome of a major decision (e.g., on a potential merger) to specific communications between the CEO and members of the board.

In our setting, we identify an exogenous shock—China's banking sector reform—to the incentives within a bank, and test how different incentive structures within the bank affect the production, quality, and use of information. In addition, we use detailed job-related histories to determine the time the loan officer (information producer) and the branch president (one of the key decision makers) have worked together, which we use as a proxy for communication costs.[9] The marginal costs of understanding each other should decline with familiarity, as greater time together allows each person to better understand the other's (private) preferences and the information they produce and transmit. However, familiarity alone does not guarantee better information production or usage—mechanisms are needed to ensure that both the information producer and the decision maker deliver good behavior. Note that we can identify the loan officer responsible for the ratings on the loans only during the post-reform period. If reform improves incentives for information production (as we will show), then time worked together ought to improve information production during this period (because communication costs decrease with familiarity).

In our first set of tests, we examine how the bank uses its internal credit ratings to set loan rates before versus after reform. If after reform loan officers have stronger incentives to produce high-quality information and such information is used to a greater extent in the lending process, their ratings should

[9] Researchers also show that social ties between bankers (e.g., Berger, Kick, and Schaeck (2014), Berger et al. (2013)) and ties between loan officers and borrowers (e.g., Uzzi (1999), Lehmann and Neuberger (2001)) can affect communication costs and banks' use of information.

better explain rates. In addition, lower communication costs between the loan officer and branch president should increase the weight the bank places on ratings in setting loan rates. Next, we estimate another 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 in the post-reform period the bank places greater weight on credit ratings in setting loan terms, then the ratings should forecast loan outcomes better after reform than before. Furthermore, if all the information produced and used by the bank improves, the forecasting power of interest rates on future outcomes should also improve.[10]

II. 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 a large sample of loans with borrower firms coming from 33 cities that are of different size and are located in different regions of China, including both the developed coastal area and the less developed inland regions. The sample comprises small branches located in rural counties, large branches located in provincial capitals, as well as branches in between. We include city fixed effects in all of our tests.

A. Summary Statistics

Table I reports summary statistics for borrower characteristics (panel A), which we include as independent variables in our tests, terms of the loan contracts (panel B), which we use as dependent variables, and information on the experience and performance of individual loan officers and bank branch presidents as well as the time worked together for officer/branch president pairs (panel C). Average firm asset size rises from RMB (the Chinese currency) 201 million in the pre-reform period to RMB 354 million in the post-reform period, and average loan size rises from RMB 4.13 million in the pre-reform period to RMB 6.63 million in the post-reform period (panel B; see panel D for exchange rates).

We note that the sample size is larger in the post-reform period, which is driven in part by the economic and lending booms following the reform. Notwithstanding, leverage (total debt *before* the current loan is obtained over total assets) is lower in the post-reform period (0.52 vs. 0.45), whereas firm profitability is higher post-reform (return on assets, or ROA, increases from 6% to 9% at the mean). However, although the firm characteristic averages show improvement in the post-reform period, the average credit rating is slightly worse in the post-reform period (5.47 vs. 5.29; the median rating is the same for both

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[10] Prior work (see, e.g., Strahan (1999), for a review) shows that loan interest rates are a strong predictor of subsequent default. In addition, Norden and Weber (2010) find that credit line usage and abnormal checking account activity help predict default by small businesses and individuals.

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Table I

Summary Statistics on Firms, Loans, and Bank Staff

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The sample data are from January 2000 to December 2006, with April 17, 2002, as the starting point of the reform. The pre-reform period runs from January 14, 2000, to April 16, 2002, and the post-reform period runs from January 1, 2004 to December 31, 2006; we drop loans originated between April 17, 2002, and December 31, 2003. In panel A, branch size is total deposits in the initial year of our data for each branch. Internal credit ratings range from one to eight, with a higher score indicating a borrower with higher credit quality. In panel B, standardized interest rate is the interest rate on a loan over the standard deviation of rates on all loans in the same year. Panel C provides information on the experience of individual loan officers and branch presidents, the time worked together for officer-president pairs, and loan officer past performance (all in the post-reform period).

Panel A. Summary Statistics			
		Initial Year (2000)	
Branch size	Max	1,268.27	
(Million RMB)	Min	106.03	
	Mean	725.72	
		Pre-Reform	Post-Reform
Number of loans		3,665	33,996
Number of firms		1,733	5,929
Number of bank branches		330	438
Firm assets	Max	10,085	37,607
(Million RMB)	Min	0.60	0.27
	Mean	201	354
Leverage	Max	0.99	0.99
	Min	0.01	0.01
	Mean	0.52	0.45
ROA	Max	0.59	0.64
	Min	−0.44	−0.35
	Mean	0.06	0.09
Credit rating	Max	8	8
From 1 (high risk) to 8 (low risk)	Min	1	1
	Mean	5.47	5.29
Loans by firm type	SOE	1,042	6,033
	Private Enterprise	743	12,764
	Other	1,880	15,199
Loans by industry	Agriculture	521	2,580
	Manufacturing	1,742	18,513
	Construction	70	706
	Utility	21	140
	Retailing	485	7,056
	Others	826	5,001

Panel B. Terms of Loan Contracts			
		Pre-Reform	Post-Reform
Actual interest rate (%)	Max	7.84	11.63
	Min	4.94	4.54
	Mean	7.00	6.89
	SD	0.59	0.98

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(*Continued*)

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Table I—*Continued*

Panel B. Terms of Loan Contracts			
		Pre-Reform	Post-Reform
Standardized interest rate (%)	Max	16.87	12.43
	Min	8.61	4.37
	Mean	12.99	7.47
Loan size (million RMB)	Max	200	395
	Min	0.51	0.50
	Mean	4.13	6.63

Panel C. Work Experience of Loan Officers and Branch Presidents (In Years; Post-Reform Period Only)

	Obs.	*SD*	Median	Mean	Min	Max
Loan officer experience	2,597	1.63	3.72	3.47	0.32	10.28
Branch president experience	2,597	4.27	4.16	5.57	1.02	26.52
Time worked together	2,597	1.40	1.58	1.69	0	6.91
Loan officer past performance	2,186	0.20	0.98	0.88	0	1

Panel D. Year-End Exchange Rate (USD to RMB)

Year	Year-End Exchange Rate (RMBs per US$)
2000	8.2784
2001–2003	8.2770
2004	8.2768
2005	8.1917
2006	7.9718

periods, at five; the range is one to eight, with a higher score indicating a safer borrower).

As noted earlier, the PBOC sets upper and lower bounds for interest rates that adjust around a base rate. The base rate is set to foster macrostabilization, and thus varies over time and across loan maturities. Using raw interest rates may generate biased coefficients because lenders can set much higher rates during later years of the sample—the maximum raw rate is indeed higher in the post-reform period, as 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 I, panel B). We therefore normalize actual rates by the standard deviation of rates on all loans in a given year. The mean standardized rate for the post-reform period is lower than that for the pre-reform period. In our tests below, we report results using both raw rates and the standardized rates.[11]

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[11] We also divide the actual rate by the standard deviation of rates during the pre-reform period (post-reform period) to adjust all pre-reform (post-reform) rates. Results using this alternative set of standardized rates are similar to those using the standard deviation of rates in a given year, and are reported in the Internet Appendix.

As discussed earlier, for those loans for which we can identify the loan officer responsible for the rating, we measure communication costs using the time overlap between the loan officer who produces the credit ratings and the branch president who approves the loans. This measure is available only after reform, when individual loan officers are responsible for the credit ratings. Table I, panel C presents data on the 2,597 loans during this period for which we have the necessary data. For each of these loans, we collect information on the experience of the loan officer and the bank branch president as well as the time overlap between the loan officer and branch president. The average tenure of a branch head is longer than that of a loan officer, whereas the average overlap between a loan officer-branch president pair is about 1.69 years.

We are able to tie loan performance to lending officers in the post-reform period for 2,186 of the 2,597 loans (made by 299 loan officers). For each loan, we compute the fraction of loans made by the same officer *prior to* loan origination that subsequently defaults. For example, consider an officer responsible for originating 10 loans. For the first loan, we would set the loan officer performance measure to missing. For the second loan, the performance measure would equal one if the first loan was ultimately paid back in full and zero otherwise. For the third loan, we would set the performance measure equal to the average performance of the first two loans, and so on for the other eight loans. Therefore, we have a performance metric for all but the first loan for each loan officer. (We also compute average past performance at the loan officer level in our regressions linking loan officer quality to their probability of promotion.) All of these loans correspond to the post-reform period, because only during this period are we able to tie a specific loan to a specific lending officer. Table I, panel C shows that, for a typical officer, 88% of their loans are paid back in full.

Our measure of information production is 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 (i.e., the highest credit quality). As described earlier, prior to the reform (first half of 2002 and earlier), individual officers who produced ratings did not sign off on the ratings report; rather, this report and all subsequent reports related to the verification and approval of the loan were signed by the same executive(s) of the branch. However, after the reform (2004 and later), individual loan officers sign the ratings report and bear personal responsibility for its quality.

Based on internal documents and discussions with bank officials at different levels and branches, we know that the production of credit ratings is based on a loan officer's evaluation of a borrower's recent and past performance, in terms of both its profitability and repayment record as well as its projected growth and performance during the loan period. Such evaluation is based on discussions with the borrower's executives, potential guarantors, business partners and customers, and local government officials who may have an interest in the firm. Thus, the rating process embeds 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 officer when the report is produced. In the Appendix, we provide two case studies on how ratings are
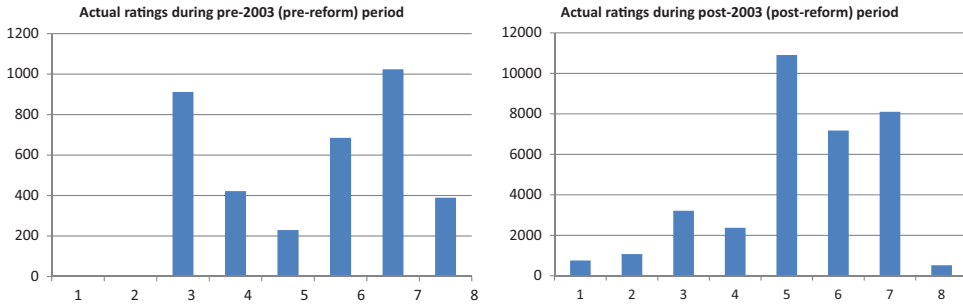
Figure 1. Distributions of actual internal ratings. In this figure, we plot histograms of actual internal ratings on loans during the pre-2003 (pre-reform) and post-2003 (post-reform) periods. There are 3,665 loans in the pre-2003 sample and 33,996 loans in the post-2003 sample. Internal ratings range from one to eight; higher ratings indicate higher credit quality.

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 power of the ratings to predict loan outcomes.

Figure 1 plots histograms of the *actual* distribution of the ratings during the pre- and post-reform periods. The two distributions differ statistically; the χ^2 statistic testing the null that they come from the same distribution exceeds 2,900 (with seven degrees of freedom). 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 three whereas only 6% receive a score of five during the pre-reform period, whereas the opposite is the case post-reform. As discussed earlier, borrowers appear to be in better financial condition post-reform than during the pre-reform period, yet the average rating in the post-reform period is slightly lower than that in the pre-reform period. Thus, making loan officers more accountable for credit ratings (based on ex post loan performance) may change the information content of credit ratings *and* shift the distribution of ratings.[12]

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

Several interesting observations emerge. First, the explanatory variables have significant (and sensible) effects on ratings in the post-reform period, with

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[12] 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.

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Table II

Regressions of Credit Ratings on Hard Information Variables

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We report OLS regression results of internal credit ratings on firm characteristics for both the pre-reform and the post-reform periods; the rating varies from one (riskiest) to eight (safest). The SOE dummy equals one when the borrower is a state-owned enterprise, and zero otherwise ("other ownership types" are the default type); the private enterprise dummy equals one when the borrower is a privately owned company, and zero otherwise. The previous default record indicator equals one when the borrower has defaulted on a loan during the 12 months prior to the application of the current loan, and zero otherwise. Standard errors are clustered by borrower firm. Robust t-statistics appear in parentheses below the coefficients; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

	Pre-Reform (1)	Post-Reform (2)	Pre-Reform (3)	Post-Reform (4)
Log assets	0.087**	0.403***	0.092**	0.356***
	(2.474)	(22.605)	(2.090)	(19.696)
Leverage	−1.293***	−1.574***	−1.412***	−1.849***
	(−5.401)	(−13.298)	(−5.124)	(−12.104)
ROA	1.728**	3.749***	1.764**	3.988***
	(2.162)	(12.815)	(2.058)	(11.924)
SOE	−0.202	−0.229***	−0.572***	−0.484***
	(−1.446)	(−3.635)	(−3.619)	(−6.700)
Private enterprise	−0.017	0.249***	−0.020	0.171***
	(−0.143)	(6.327)	(−0.143)	(3.686)
Previous default record	0.227*	−0.382***	0.403**	−0.457***
	(1.709)	(−8.900)	(2.563)	(−8.952)
Total asset turnover	0.080**	0.040	0.146***	0.023
	(2.171)	(1.428)	(3.966)	(0.979)
Year dummies	Yes	Yes	No	No
City dummies	Yes	Yes	No	No
Industry dummies	Yes	Yes	No	No
Observations	3,665	33,996	3,665	33,996
Adjusted-R^2	0.378	0.389	0.083	0.229

signs on the coefficients that are consistent with the prediction that firms with better financial condition and prior credit records receive higher ratings. By contrast, in the pre-reform period, a firm that has defaulted on a loan during the 12-month period before applying for the current loan 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) in the post-reform period is nearly double that in the pre-reform period.

Third, the 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 vs. 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 0.378 to 0.083 (columns 1 and 3). In contrast, dropping the fixed effects from the post-reform sample only lowers the adjusted-R^2 from 0.389 to 0.229 (columns 2 and 4). Credit ratings thus capture borrower financial characteristics (as opposed to simple city, year, and industry effects) better

after the reform, consistent with improved loan officer incentives leading to higher-quality ratings.

B. Empirical Strategy

We first test whether the links between the bank's credit ratings and loan interest rates as well as loan default strengthen when (1) individuals' incentives to produce and use better ratings increase (pre-reform versus post-reform), and (2) the costs of communication between the loan officer who produces information and the executive who approves the loans fall. Next, to assess if the overall production and use of information improves, as opposed to a change in the formal credit rating report, we test whether a borrower's loan interest rate better predicts loan outcomes (1) after reform versus before reform, and (2) for loans made by officers working longer with the branch president. As discussed earlier, individual loan officer responsibility increased in response to pressure on state-owned banks to adopt best practices after China entered the WTO. This change is plausibly exogenous from the perspective of loan officers engaged in information production and contracting with borrowers.

Because time overlaps between the loan officer and the executive of the same branch mechanically correlate with the experience of both individuals, we also include the experience of the loan officer and the experience of the branch president as separate control variables in the model. Our measure of communication costs is available only 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) and *Time worked together*. One concern with this test is that assignments of borrowers to loan officers may 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 the ex post outcomes may be attenuated for these loans. To assess this concern, we test whether loan assignments are correlated with individual experiences and, more critically, the length of the time overlap between the loan officer and the branch president.

To summarize, we test three sets of models. In the first, we use the borrower's credit rating 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 interest rates and outcomes. In the second set of models, we use the post-reform period only, and we interact *Time worked together* with the rating. In the third set of models, we replace the credit rating with the loan interest rate in forecasting default, which should serve as a sufficient statistic for the bank's overall assessment of credit quality. Analytically, we test

$$Interest\ rate\ (or\ default)_{i,t} = \beta^1 Rating_{i,t} + \beta^2 Rating_{i,t} \times Post\text{-}reform_t$$
$$+ Fixed\ effects + Firm\ controls\ and\ interactions$$

$$+ \varepsilon_{i,t},$$
$$t = 2000 - 2006 \ (second \ half \ of \ 2002$$
$$and \ 2003 \ omitted) \qquad (1)$$

$$Interest \ rate \ (or \ default)_{i,t} = \text{\ss}^1 Rating_{i,t} + \text{\ss}^2 Time \ worked \ together_{i,t}$$
$$+ \text{\ss}^3 Rating_{i,t} \times Time \ worked \ together_{i,t}$$
$$+ Individual \ experience \ measures \ and$$
$$interactions \ with \ ratings + Fixed \ effects$$
$$+ Firm \ controls \ and \ interactions_{i,t} + \varepsilon_{i,t},$$
$$t = 2004 - 2006 \ (post\text{-}reform \ subsample \ only) \quad (2)$$

$$Default_{i,t} = \text{\ss}^1 Interest \ rate_{i,t} + \text{\ss}^2 Interest \ rate_{i,t}$$
$$\times Post\text{-}reform_t + Fixed \ effects$$
$$+ Firm \ controls \ and \ interactions \ + \varepsilon_{i,t},$$
$$t = 2000 - 2006 \ (second \ half \ of \ 2002 \ and \ 2003 \ omitted) \quad (3a)$$

$$Default_{i,t} = \text{\ss}^1 Interest \ rate_{i,t} + \text{\ss}^2 Time \ worked \ together_{i,t}$$
$$+ \text{\ss}^3 Interest \ rate_{i,t} \times Time \ worked \ together_{i,t}$$
$$+ Individual \ experience \ measures \ and \ interactions$$
$$with \ interest \ rate$$
$$+ Fixed \ effects + Firm \ controls + \varepsilon_{i,t},$$
$$t = 2004 - 2006 \ (post\text{-}reform \ subsample \ only), \qquad (3b)$$

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 borrower firms. The year effects absorb the direct impact of *Post-reform* (as well as time-varying macroeconomic conditions), so we only report its interaction with the credit rating.

In estimating equations (1) and (2), the pricing measure is based on both the actual rate and the standardized rates (to account for changes in the spread of the rate distribution over time). We estimate both sets of variables using OLS.[13] Our measure of loan outcomes (equations (3a) and (3b)) equals one for loans

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[13] Because some of the loan rates may be constrained by government bounds on interest rates, we have also estimated our models without loans whose interest rates hit the upper or lower bound set by policy (reported in the Internet Appendix). The results are similar to those reported below, as fewer than 10% of the loans need to be filtered out.

that are paid off in full and on time, and zero otherwise; we report marginal effects from Probit regressions for this variable.

The key variables of interest are the interaction effects between the credit rating and (1) the policy innovation (*Post-reform*), and (2) the length of time a loan officer and branch president have worked together (*Time worked together*).[14] We expect an increase in a borrower's credit rating to lead to lower interest rates and better outcomes. The marginal effect of rating should strengthen after 2003 with better loan officer incentives, or when the time worked together is longer. Hence, we expect the same sign for β^1 and β^2 in equation (1) and β^1 and β^3 in equation (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 expect the same sign for β^1 and β^2 in equation (3a) and β^1 and β^3 in equation (3b).

Our control variables for borrower credit quality include the log of borrower assets, (lagged) ROAs, leverage, indicators for loan type and purpose (e.g., fixed asset investment, real estate investment, and working capital), and an indicator equal to one if the borrower has defaulted on a prior loan. We also include an indicator for SOEs and an indicator for privately owned firms; all other ownership types, including a mixture of government and private ownership, are the omitted group.[15] Each of the firm characteristics is measured in the year prior to loan origination. To capture variation in the sophistication of management across branches, which could be associated with both information production and the rate of adoption of new lending practices, we include beginning-of-period branch size (total deposits in 2000) and its interaction with the credit rating (or interest rate). For equations (1) and (3a), we also include the full set of interactions between each of our borrower control variables and the policy innovation indicator (*Post-reform*).

B.1. Comparing Coastal and Inland Provinces

Discussions with officials from the bank's headquarters and various branches of the bank suggest that the reform has had a greater impact in coastal provinces compared to inland ones. First, although new rules related to the reform were announced in April 2002 and should be implemented in the same way across all branches, their effectiveness depends on the quality and training of branch staff. The average quality of staff in coastal provinces is higher than

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[14] Once again, we drop data from the second half of 2002 and 2003, the period of the policy change. Including these observations strengthens the results in Tables IV, VIII, and IX (see the Internet Appendix).

[15] SOEs in our sample include enterprises with 100% state ownership, 100% "collective" ownership (involving local governments), and joint ventures of state-owned and collectively owned firms. Our classification of SOEs is somewhat different from traditional definitions (e.g., firms with more than 50% government ownership stakes), as we do not have information on the exact ownership size for borrowers with multiple types of owners. Private enterprises in our sample are those with 100% private ownership. Thus, the omitted category includes firms with partial government ownership but not full control, foreign ventures, and joint ventures of these types of firms.

in inland ones, as the banking sector in coastal provinces is more developed, with each bank facing more competition and employees having higher salaries and total compensation. Based on internal reports, there were more misunderstandings and mistakes regarding new rules associated with the lending process from inland branches than from coastal branches. Moreover, economic development, industrialization, and institutional quality are all higher or better in coastal provinces. For example, the average per capita GDP in coastal provinces on the eve of reform in 2001 was RMB 10,900 compared to RMB 6,200 in inland provinces. The value of total assets of industrial enterprises per capita is also higher in coastal provinces compared to inland ones.[16]

To test this conjecture on the differential impact of the reform, we add the interaction between *Post-reform* and the *Coastal* indicator.[17] This approach captures the idea that bank branches located in areas with more advanced development and better institutions are under greater pressure to adopt best practices after reform. Moreover, this approach has the advantage of simplicity and parsimony, because whether a province is coastal does not vary over time, which allows us to cleanly trace differences in how reform affects lending practices across the two types of provinces. Alternative measures of development, such as industrialization or per capita GDP, are not fixed over time and may themselves be affected by reform either directly or as a consequence of changes in the operation of the banking system.[18]

B.2. Loan Officer Performance and Promotion

Before turning to our main results, we want to offer some support for the premise of our first set of tests, which is that the incentive environment after reform encourages more accurate information production and use. This premise is not fully testable, as the committee-based decision-making approach prior to reform makes it hard to measure the impact of incentives (no accountability). After reform, however, we can link ex post loan outcomes to the individual

[16] Industrial enterprises are defined as enterprises including all SOEs and other non-state-owned industrial enterprises whose annual operating income is above RMB 5 million.

[17] Coastal provinces include Fujian, Guangdong, and Shandong; inland provinces include Guangxi, Hebei, Henan, and Xinjiang. Coastal provinces may have better outcomes than inland ones due to a virtuous interaction between regional endowments and government policies that help attract foreign investment and encourage finance. For example, Braun and Raddatz (2004) find that trade liberalization that helps promoters of financial openness leads to subsequent improvements in financial development.

[18] For robustness, we estimate our models replacing the coastal indicator with the NERI (National Economics Research Institute) index of Fan, Wang, and Zhu (2006), along with its interaction with the post-reform indicator (see the Internet Appendix). The NERI index has five major components: (1) the size of the government in the regional economy; (2) the region's economic structure, mainly concerning the growth of the non-state sector and the reform of SOEs; (3) interregional trade barriers, including price controls; (4) factor-market development, including factor mobility; and (5) the region's legal framework, with a higher score indicating higher quality institutions. Consistent with our evidence for the coastal indicator, we find a strong interaction between the post-reform indicator and the NERI index, in that the impact of reform on ex ante lending practice is much stronger in areas with stronger institutions and more industrialization.

Table III

Regressions of the Likelihood of Promotion on Loan Officers' Past Performance

This table reports marginal effects from Probit regressions of *Promoted*, which equals one if a loan officer was promoted to a higher position (similar ranking as a branch president) within the same branch or moves from a lower-level branch to a higher-level one (holding a similar or higher position), and zero otherwise. Average past performance is the percentage of loans fully repaid on time out of all (post-reform) loans processed by the loan officer before the promotion; for those *not* promoted, we use the average performance of all loans made by the officer through the end of the sample. Average credit rating equals the average rating on borrower firms processed by the loan officer in the post-reform period; coastal equals one for branches located in coastal regions, and zero for inland branches; length of service equals the log of the number of days the officer had been working at the time of the promotion. Data are from the post-reform period only (for 299 officers), because we can only observe loan officer performance after the reform. Robust z-statistics are in parentheses below the coefficients; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

	(1)	(2)	(3)	(4)
Average past performance	1.082***	1.128***	0.762***	−0.095
	(5.268)	(5.363)	(2.917)	(−0.134)
Coastal*Average past performance	–	–	0.822**	0.916**
	–	–	(2.036)	(2.173)
Average credit rating	−0.122***	−0.123***	−0.124***	−0.278**
	(−4.258)	(−4.284)	(−4.371)	(−2.260)
Average past performance*	–	–	–	0.181
Average credit rating	–	–	–	(1.308)
Length of service	–	0.048	0.053	0.054
	–	(1.349)	(1.493)	(1.502)
City dummies	Yes	Yes	Yes	Yes
Observations	299	299	299	299
Pseudo-R^2	0.316	0.321	0.332	0.337
Past performance				
Mean		0.88		
SD		0.20		

lending officers who produce credit ratings, and thus we can test whether better performance is rewarded with promotion.[19]

Table III reports Probit models based on a sample of 299 loan officers, where the dependent variable equals one if a given officer receives a promotion and zero otherwise. Promotions include moving from a loan officer position to a higher-ranked position within the same branch (similar ranking as the branch president) and moving from a lower-ranked branch to a higher-ranked branch (holding a similar or higher position). To test for performance incentives, we

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[19] We do not have information on negative consequences of poor performance such as forced terminations or demotions. Several recent papers (e.g., Cole, Kanz, and Klapper (2015), Gropp, Gruendl, and Guettler (2012)) examine how loan officer incentives and discretion affect the riskiness of bank loans. In particular, Agarwal and Ben-David (2012) 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 induces loan officers to approve more risky loans.

include the average fraction of loans paid off in full for the officer's portfolio. This average is measured at the point of promotion for loan officers who are promoted; for those not promoted, we use the average performance of all loans made by the officer through the end of our sample. We report models with city-level fixed effects as well as the tenure of the individual loan officer. In addition, we control for the average credit rating of the officer's portfolio (to control for the risk of the borrower firms in the portfolio), and we report models that allow the marginal effect of performance to vary by region (coastal vs. inland provinces).

We find that promotions are linked to loan performance, and that this link is greater in the coastal provinces. The marginal effects from the model suggest that a one standard deviation increase in loan performance leads to a 23 percentage point increase in promotion probability ($= 0.20 \times 1.128$, from column 2). In the coastal provinces, this effect increases to about 32 percentage points ($= 0.20 \times (0.762 + 0.822)$, from column 3). These results motivate further investigation of the differential effects of the reform across coastal versus inland provinces. We also find that promotions are negatively linked to the average credit rating of loans handled by an officer, although this effect does not interact or mitigate the strength of past performance on promotions.[20]

C. Results

Tables IV and VI report the main results for loan interest rates, and Tables VIII and IX report results on loan outcomes; these are the estimations of equations (1), (2), (3a), and (3b). Table V reports correlations between borrower characteristics and communication costs between the loan officer and branch executive (*Time worked together*) as well as their individual experiences. Table VII reports descriptive statistics on outcomes. Table X reports the key interactions from a set of robustness tests.

C.1. Ex Ante Contract Terms

Table IV reports OLS results for loan pricing, using both actual rates and standardized rates. 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. To save space, we do not report the coefficients on the interactions between the post-reform dummy and the borrower controls.

The results suggest that increasing the accountability of loan officers improves the value of the information they create. Lenders place greater weight on loan-officer-produced credit ratings in setting rates after reform than before.

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[20] One interpretation is that lower average ratings indicate more complex loans, and thus officers coping with riskier borrowers are more likely to be promoted ex post. We have also estimated the models in Table III using a linear probability framework (OLS) and the results are similar to those reported here (see the Internet Appendix).

Table IV

Regression of Ex Ante Loan Terms on Credit Rating: Pre-Reform versus Post-Reform

We report OLS regression results of loan interest rates (actual and standardized rates) on the internal credit rating and its interaction with the post-reform dummy; the rating varies from one (riskiest) to eight (safest). The standardized interest rate is the actual interest rate on a loan over the standard deviation of rates on all loans in a single year. The post-reform dummy equals one when the loan is made after the reform, defined as in Table I; coastal equals one for branches located in coastal regions, and zero for inland branches. Branch size is total deposits (in billions of RMB) in the initial year of our sample period (2000). Firm controls and interactions include financial variables (firm size, leverage, ROA), ownership types (SOE), previous default record, total asset turnover ratio, and interactions between the post-reform indicator and the financial variables. Standard errors are clustered by borrower firm. Robust t-statistics appear in parentheses below the coefficients; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

	Actual Interest Rate (1)	Standardized Interest Rate (2)	Actual Interest Rate (3)	Standardized Interest Rate (4)
Credit rating	0.010	0.009	−0.022	−0.006
	(0.694)	(0.504)	(−1.534)	(−0.351)
Post*Credit rating	−0.080***	−0.087***	−0.037***	−0.063***
	(−5.824)	(−4.920)	(−2.633)	(−3.427)
Coastal*Credit rating	−	−	0.035***	−0.003
	−	−	(2.612)	(−0.154)
Coastal*Post*Credit rating	−	−	−0.082***	−0.036***
	−	−	(−7.887)	(−2.671)
Branch size	−0.069	−0.109	−0.163**	−0.203**
	(−0.962)	(−1.333)	(−2.161)	(−2.382)
Branch size*Credit rating	0.002	0.010	0.020	0.027*
	(0.180)	(0.619)	(1.416)	(1.695)
Log assets	−0.195***	−0.220***	−0.196***	−0.220***
	(−20.891)	(−21.432)	(−21.017)	(−21.453)
Leverage	−0.127**	−0.146**	−0.128**	−0.145**
	(−2.415)	(−2.483)	(−2.428)	(−2.465)
ROA	0.122	0.023	0.136	0.029
	(0.866)	(0.157)	(0.975)	(0.195)
SOE	0.059	−0.122*	0.103**	−0.106
	(1.141)	(−1.696)	(1.988)	(−1.470)
Private enterprise	0.155***	0.167***	0.163***	0.171***
	(7.404)	(7.491)	(7.780)	(7.720)
Previous default record	0.147***	0.152***	0.135***	0.147***
	(7.376)	(7.066)	(6.882)	(6.923)
Total asset turnover	−0.031***	−0.031***	−0.030***	−0.031***
	(−3.356)	(−3.232)	(−3.245)	(−3.151)
Post*Firm controls	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
City dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	37,661	37,661	37,661	37,661
Adjusted-R^2	0.545	0.887	0.548	0.887

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Table V

Correlations between Work Experience and Borrower Characteristics

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This table reports simple correlations between loan officer experience, branch president experience, the time the two have worked together in the same branch, and loan officer past performance with borrower characteristics and credit ratings. The sample is 2,597 loans from the post-reform period (2,186 for the sample with loan officer past performance).

	Log Asset	Leverage	ROA	SOE	Private	Default Record	Total Asset Turnover	Credit Rating
Loan officer experience	−0.057	0.011	0.030	−0.005	−0.018	−0.045	−0.041	0.045
Branch president experience	−0.250	−0.118	0.201	−0.113	0.109	−0.156	0.089	−0.098
Time worked together	−0.078	−0.043	0.040	−0.002	−0.015	−0.109	−0.047	0.083
Loan officer past performance	−0.087	−0.054	0.071	−0.074	0.067	−0.081	0.068	0.019

The effect of a borrower's credit rating prior to reform is small and not statistically significant, while it becomes large, both statistically and economically, after reform. For example, increasing the credit rating from the 25th to the 75th percentile (an increase of about four notches) lowers the actual interest rate by 0.31 standard deviations of the interest rate (= 4 × (0.009 − 0.087), from column 2). We also find that the incremental increase in the value of the credit rating is greater in coastal provinces relative to the rest of the country (columns 3 and 4). In such areas, an increase in the credit rating from the 25th to the 75th percentile lowers the actual interest rate by 0.43 standard deviations of the interest rate (= 4 × (−0.006 − 0.063 − 0.003 − 0.036), from column 4). The economic magnitude is smaller but still statistically significant in inland areas.

The above evidence suggests there is no marginal value to a firm's credit rating, above what can be predicted from simple measures of borrower observables, when the rating was produced by lending committees. That is, prior to reform credit ratings are both somewhat inflated (recall Figure 1) and devoid of meaningful information. After reform, when individual lenders are accountable for the ratings they produce, credit ratings add substantive power to explain loan rates. The effects of most of the firm control variables enter the models as expected. For example, larger firms receive better loan terms and firms that have past defaults receive worse terms. We also find a large effect of the indicator *Private*, suggesting that both SOEs and the omitted group (which includes firms with partial government ownership stakes) pay lower rates (0.17 using standardized rates) on their loans than privately owned firms. This effect remains similar after reform (not reported).

Before we examine the effects of communication costs on the use of information, we examine whether there is a consistent correlation between loan assignments and observable borrower characteristics. This is important

Table VI
Regression of Ex Ante Loan Terms on Credit Rating: The Effect of Communication Costs in the Post-Reform Period

We report OLS regression results of loan interest rates (actual and standardized) on credit rating and interactions with loan officer experience (in years), branch president experience (in years), and time worked together of the loan officer and president (in years). The sample includes the post-reform period only; ratings vary from one (riskiest) to eight (safest). Branch size is total deposits (in billions of RMB) in the initial year of our sample period (2000) for each branch. The standardized interest rate is the interest rate on a loan over the standard deviation of rates on all loans in a given year. Officer past performance is measured at the loan level: for each loan, we compute the fraction of loans made by the same officer prior to loan origination that subsequently default. Standard errors are clustered by borrower firm. Robust t-statistics appear in parentheses below the coefficients; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

	Actual Rate (1)	Std. Rate (2)	Actual Rate (3)	Std. Rate (4)	Actual Rate (5)	Std. Rate (6)	Actual Rate (7)	Std. Rate (8)
Credit rating	−0.091***	−0.088***	−0.025	−0.028	0.000	−0.000	−0.027	−0.011
	(−4.645)	(−4.626)	(−0.500)	(−0.567)	(0.006)	(−0.008)	(−0.329)	(−0.134)
Time worked together*	—	—	−0.034***	−0.033***	−0.030**	−0.028**	−0.030**	−0.029**
Credit rating			(−2.688)	(−2.637)	(−2.088)	(−2.042)	(−2.106)	(−2.091)
Loan officer experience*	—	—	—	—	−0.001	−0.001	−0.002	−0.000
Credit rating					(−0.076)	(−0.055)	(−0.149)	(−0.045)
Branch president experience*	—	—	—	—	−0.007	−0.007	−0.007	−0.007
Credit rating					(−1.400)	(−1.595)	(−1.479)	(−1.625)
Officer past performance	—	—	—	—	—	—	−0.219	−0.131
							(−0.548)	(−0.344)
Officer past performance*	—	—	—	—	—	—	0.039	0.020
Credit rating							(0.519)	(0.282)
Time worked together	−0.085***	−0.079***	0.090	0.088	0.067	0.064	0.070	0.068
	(−3.026)	(−2.901)	(1.319)	(1.328)	(0.859)	(0.856)	(0.892)	(0.906)
Loan officer experience	−0.023	−0.022	−0.020	−0.019	−0.015	−0.015	−0.010	−0.015
	(−1.303)	(−1.289)	(−1.137)	(−1.121)	(−0.259)	(−0.269)	(−0.180)	(−0.272)

(Continued)

Table VI—*Continued*

	Actual Rate (1)	Std. Rate (2)	Actual Rate (3)	Std. Rate (4)	Actual Rate (5)	Std. Rate (6)	Actual Rate (7)	Std. Rate (8)
Branch president experience	−0.007	−0.007	−0.007	−0.007	0.028	0.032	0.030	0.033
	(−0.756)	(−0.775)	(−0.696)	(−0.710)	(1.121)	(1.314)	(1.195)	(1.350)
Branch size	−0.109	−0.095	−0.079	−0.088	−0.138	−0.154	−0.156	0.104
	(−1.055)	(−0.941)	(−0.330)	(−0.377)	(−0.547)	(−0.625)	(−0.618)	(0.276)
Branch size* Credit rating	—	—	−0.010	−0.006	−0.001	0.004	0.003	0.007
	—	—	(−0.228)	(−0.136)	(−0.020)	(0.096)	(0.053)	(0.155)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,597	2,597	2,597	2,597	2,597	2,597	2,597	2,597
Adjusted-R^2	0.503	0.625	0.507	0.628	0.509	0.630	0.508	0.503

Table VII
Summary Statistics on Ex Post Loan Performance

This table reports simple default statistics sorted by internal credit ratings, divided into pre- and post-reform regimes. Pay off on time means the borrower pays off the entire loan on or before the maturity date, otherwise the borrower is in default, using one year after the original loan maturity date as the cutoff date for (late) repayment. Credit ratings vary from one (riskiest) to eight (safest).

Credit Rating		Pre-Reform (Before 2003)								Post-Reform (After 2003)							
		1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Breach of contract (%)	Did not 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
Contract performance (%)	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
Number of loans		4	0	912	422	229	685	1,024	389	753	1,071	3,201	2,364	10,845	7,160	8,077	525

<div align="center">Table VIII</div>

Regression of Ex Post Loan Outcomes on Credit Rating

In columns 1 and 2, we report marginal effects from Probit regressions of loan performance on the credit rating and its interactions with the post-reform indicator and a coastal indicator; ratings vary from one (riskiest) to eight (safest). In columns 3 and 4, we report marginal effects from Probit regressions of loan performance on the credit rating and its interaction with loan officer experience (in years), branch president experience (in years), and the time working together of the loan officer and branch president (in years); officer past performance (measured at the loan level) is the fraction of loans made by the same officer prior to loan origination that subsequently default. Branch size is total deposits (in billions of RMB) in the initial year (2000) of our sample period. Firm controls include financial variables (firm size, leverage, ROA), ownership type (SOE), previous default record, and total asset turnover ratio. The dependent variable equals one if a loan is paid in full at the maturity date and zero otherwise. Standard errors are clustered by borrower firm. Robust z-statistics appear in parentheses below the coefficients; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

	Loan Outcome (Pre-Reform vs. Post-Reform)		Loan Outcome (Post-Reform)	
	(1)	(2)	(3)	(4)
Credit rating	−0.000	0.003	0.014	0.029
	(−0.082)	(0.617)	(0.966)	(0.958)
Post*Credit rating	0.025***	0.019***	–	–
	(5.357)	(3.928)	–	–
Coastal* Credit rating	–	0.011**	–	–
	–	(2.119)	–	–
Coastal*Post* Credit rating	–	0.006	–	–
	–	(1.621)	–	–
Time worked together* Credit rating	–	–	0.009**	0.008**
	–	–	(2.194)	(2.082)
Loan officer experience* Credit rating	–	–	0.000	0.001
	–	–	(0.005)	(0.288)
Branch president experience* Credit rating	–	–	−0.002	−0.002*
	–	–	(−1.594)	(−1.700)
Time worked together	–	–	−0.023	−0.019
	–	–	(−1.143)	(−0.994)
Loan officer experience	–	–	−0.006	−0.010
	–	–	(−0.391)	(−0.653)
Branch president experience	–	–	0.001	0.001
	–	–	(0.169)	(0.226)
Officer past performance	–	–	–	0.176
	–	–	–	(1.189)
Officer past performance* Credit rating	–	–	–	−0.019
	–	–	–	(−0.642)
Branch size	−0.023	0.019	−0.036	−0.022
	(−1.002)	(0.741)	(−0.600)	(−0.363)
Branch size* Credit rating	0.011***	0.003	0.012	0.010
	(2.637)	(0.569)	(0.974)	(0.786)
Firm controls	Yes	Yes	Yes	Yes
Post*Firm controls	Yes	Yes	–	–

<div align="right">(<i>Continued</i>)</div>

Table VIII—*Continued*

	Loan Outcome (Pre-Reform vs. Post-Reform)		Loan Outcome (Post-Reform)	
	(1)	(2)	(3)	(4)
Year dummies	Yes	Yes	Yes	Yes
City dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	37,661	37,661	2,416	2,416
Pseudo-R^2	0.190	0.191	0.193	0.199

because, as mentioned earlier, we do not have an exogenous policy instrument to vary communication costs. It may be the case that riskier loans are assigned to more experienced loan officers or to loan officers who have performed better, or it may be the case that they are assigned to loan officers who are closer to, and thus can communicate better with, the branch president. Such nonrandom assignments could confound our results.

From Table V, we see that the correlations between (observable) 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 that have a long history working for the president ($\rho = -0.109$). There is virtually no correlation between ROA and *Time worked together* ($\rho = 0.04$). Furthermore, a borrower's credit rating has a correlation of just 0.083 with *Time worked together*. Thus, there is little evidence that borrower quality is systematically related to loan officer characteristics, at least based on observables.

Table VI reports estimates for (2), where the loan rate is the dependent variable. The first two columns include the three experience variables, along with the firm's credit rating and the other controls; columns 3 and 4 include the interaction between *Time worked together* (loan officer/branch president) and the rating; and columns 5 and 6 add interactions between the rating and the two work experience variables (*Loan officer experience* and *Branch president experience*). From the first two columns, we find a somewhat larger impact of credit ratings on interest rates, relative to what was estimated in Table IV. At the same time, *Time worked together* is significantly related to interest rates, while *Branch president experience* and *Loan officer experience* are not. For example, interest rates are somewhat lower when loan officers have longer histories working with the branch president. Increasing *Time worked together* by one standard deviation (1.4 years) decreases the standardized interest rate by 0.11 ($= -0.079 \times 1.4$; column 2).

Columns 3 to 6 of Table VI show that the marginal effect of a firm's credit rating on loan contracts grows as loan officer time with the branch president increases. At the mean of *Time worked together* (1.69 years), a four-notch increase in credit rating would lead to a 0.34 decrease in the standardized rate ($= (-0.028 - 0.033 \times 1.69) \times 4$, from column 4); the same four-notch increase in credit rating would result in a 0.52 decrease in the standardized interest rate ($= (-0.028 - 0.033 \times 3.1) \times 4$) when *Time worked together* is one standard deviation higher (from 1.69 years to 3.1 years). This result is robust to including the other two experience variables interacted with the credit rating. In fact, only *Time worked together* increases the weight placed on the credit rating in setting 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).

These results could be biased to the extent that *Time worked together* proxies for loan officer ability. For example, if loan officers differ in their ability and branch presidents learn of their quality only over time, then loan officers with longer histories with the branch president may be better performers. In this case, there may be a positive (spurious) correlation between *Time worked together* and loan officer quality, where branch presidents value information more from high-quality loan officers. To assess this possibility, we test whether the effect of interest (i.e., the coefficient on *Time worked together*Credit rating*) is attenuated when we add our proxy for loan officer quality, as would be the case if the endogeneity problem just described is important. As shown in columns 7 and 8, *Officer past performance*Credit rating* does not enter the regression significantly, and its inclusion does not change the magnitude of the coefficient of interest. This result does not fully resolve all endogeneity concerns, but there are no obvious candidate instruments for *Time worked together* that are both powerful and excludable. So, rather than report implausible instrumental variable tests with invalid instruments, we have instead tried to go as far as we can to rule out alternative explanations for our findings.[21]

C.2. Ex Post Outcomes

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

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[21] We can only measure past performance for 2,186 of the 2,597 loans (see Table I). To keep these loans in the sample, we code past performance at zero for these cases (rather than drop them); to avoid biasing the coefficient of interest, we also introduce an indicator equal to one for the loans with missing values for past performance and the interaction of this indicator with the credit rating.

Here we test this idea directly by estimating whether a borrower firm's 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 can observe whether the borrower paid the lender on time or was in default up to one year after the original loan maturity date. 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 eventually paid off the loan but were late on some of the payments. During the post-reform period, for which we have a larger sample, 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 VII reports the simple default statistics by credit rating, divided into pre- and post-reform regimes. As noted earlier, firms with credit scores below three appear to gain access to credit after reform, whereas they were rationed out of the market earlier; very few borrower firms received the highest score (eight) in the post-reform period. Comparing outcomes for firms rated three 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 three to eight, while post-reform this probability rises monotonically (with ratings) from 72.8% to 100%. Moreover, pre-reform the default rate is actually worse for ratings four to seven relative to ratings bin three; only firms in the highest ratings category had better performance than those in bin three.

Table VIII reports outcome regression results using the same structure that we applied to loan interest rates. The dependent variable equals one for loans that paid back in full and on time and zero otherwise; we report the marginal effects from a Probit model.[22] In columns 1 and 2 we include all the loans from pre- and post-reform periods, and in columns 3 and 4 we include the subsample of loans from the post-reform period for which we have information on work experience. The regressions are similar in spirit to the conditional means in Table VII, but they control for all of the borrower characteristic and interactions terms.

From column 1 of Table VIII, we see that, 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 between the post-reform indicator and credit rating is statistically significant at the 1% level. Together with the direct effect, this result indicates that a one-notch improvement in rating would increase the probability of full repayment by 2.5% (= 0.000 + 0.025). Beyond the coefficients of most interest, we find that all the firm controls (not reported) come in as expected in terms of their impact on the likelihood of default: larger firms and firms with lower leverage, higher ROA, and no prior

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[22] We also run all of our Probits as linear probability models (reported in the Internet Appendix). The results produce similar magnitudes for all of the coefficients, including the interaction terms, although the statistical significance is usually a bit weaker.

default are less likely to default on the current loan. We do not find evidence that a borrower's credit rating predicts outcomes better in coastal provinces as a consequence of reform (although it does forecast overall outcomes better in these areas; see column 2).

Columns 3 and 4 of Table VIII report models similar to those in Table VI. In particular, in these tests we use the subsample of loans from the post-reform period with loan officer details, but replace the ex ante rate with ex post default as the dependent variable. We observe outcomes for 2,416 of the 2,597 post-reform loans. Consistent with Table VI, we find that credit ratings have strong predictive power in the post-reform period when interacted with *Time worked together*. In contrast, there is no effect of the branch president's experience, the loan officer's experience, or the loan officer's past performance on the marginal effect of the credit rating. That is, the credit rating interacts significantly only with *Time worked together*. Thus, both the ex ante terms and the ex post outcomes are more strongly related to the credit ratings when our proxy for communication costs is low.

C.3. Linking Interest Rates to Outcomes

We have shown that credit ratings contain more information both after reform—when individual incentives are stronger—and when the loan officer is closer to the ultimate decision authority within the branch—communication costs are lower. These results are consistent with the idea that information production and use are more efficient after reform. A skeptic might argue, however, that a more informative credit rating need not imply a more informed banker. For instance, it is possible that in the pre-reform years, bankers were equally well informed but failed to display their knowledge formally in a credit rating. To rule out this possibility, we link a borrower's loan interest rate to default. If the bank is better informed post-reform, then the interest rate ought to better predict default; similarly, if the bank is better informed when the loan officer has worked with the branch president longer, the interest rate ought to better predict default as *Time working together* increases.

Table IX, which reports estimates of equations (3a) and (3b), documents exactly these patterns. In particular, the coefficient on the standardized interest rate is small pre-reform (column 1), whereas after reform a one standard deviation increase in the interest rate is associated with a decrease in repayment probability of about 2.7 percentage points ($= -0.001 - 0.026$). This effect holds regardless of whether we control for firm characteristics or other nonpricing terms (not reported). Moreover, the effect of interest rates on outcomes after reform is more pronounced in coastal provinces (column 2), consistent with our earlier finding that incentives for information production are stronger in those areas (recall Tables III and IV). Focusing on the post-reform sample, we also find that the incremental effect of the interest rate on future default strengthens with *Time worked together* (columns 3 and 4). As in the earlier tables, however, neither the loan officer's experience or past performance nor the branch president's experience interacts significantly with the loan interest

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Table IX

Regression of Ex Post Loan Outcome on Ex Ante Interest Rate

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We report marginal effects from Probit regressions of loan outcomes on the standardized interest rate (interest rate/sample standard deviation of rates for that year) and interactions with the post-reform and coastal indicators (columns 1 and 2) and time worked together (columns 3 and 4). The dependent variable equals one if a loan is paid in full at the maturity date and zero otherwise. The post-reform dummy equals one when the loan is made after the reform (post-2003) and zero otherwise; officer past performance (measured at the loan level) is the fraction of loans made by the same officer prior to loan origination that subsequently default. We include the following firm control variables: financial variables (firm size, leverage, ROA), ownership types (SOE, private), previous default record, total asset turnover ratio, and the interactions between the post-reform indicator and the financial variables. Branch size is total deposits (billions of RMB) in the initial year (2000) of our sample period for each branch. Standard errors are clustered by borrower firm. Robust z-statistics appear in parentheses below the coefficients; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

	Loan Outcome (Pre-Reform vs. Post-Reform)		Loan Outcome (Post-Reform)	
	(1)	(2)	(3)	(4)
Std. interest rate	−0.001	0.004	−0.022	0.022
	(−0.107)	(0.486)	(−0.880)	(0.411)
Post*Std. interest rate	−0.026***	−0.030***	–	–
	(−3.301)	(−3.683)	–	–
Coastal*Std. interest rate	–	0.006	–	–
	–	(1.520)	–	–
Coastal*Post*	–	−0.005**	–	–
Std. interest rate	–	(−2.097)	–	–
Time worked together*	–	–	−0.016**	−0.014**
Std. interest rate	–	–	(−2.157)	(−2.028)
Loan officer experience*	–	–	−0.003	−0.002
Std. interest rate	–	–	(−0.473)	(−0.422)
Branch president experience*	–	–	0.003*	0.002
Std. interest rate	–	–	(1.699)	(1.569)
Time worked together	–	–	0.118**	0.110**
	–	–	(2.491)	(2.363)
Loan officer experience	–	–	0.011	0.009
	–	–	(0.319)	(0.265)
Branch president experience	–	–	−0.024**	−0.023**
	–	–	(−2.300)	(−2.182)
Officer past performance	–	–	–	0.408
	–	–	–	(1.234)
Officer past performance*	–	–	–	−0.049
Credit rating	–	–	–	(−0.992)
Branch size	0.112***	0.142***	0.201	0.207
	(3.905)	(4.469)	(1.578)	(1.603)
Branch size*	−0.010***	−0.014***	−0.027	−0.028
Std. interest rate	(−3.090)	(−3.741)	(−1.418)	(−1.416)
Firm controls	Yes	Yes	Yes	Yes
Post*Firm controls	Yes	Yes	–	–

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(*Continued*)

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Table IX—*Continued*

	Loan Outcome (Pre-Reform vs. Post-Reform)		Loan Outcome (Post-Reform)	
	(1)	(2)	(3)	(4)
Year dummies	Yes	Yes	Yes	Yes
City dummies	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Observations	37,661	37,661	2,416	2,416
Pseudo-R^2	0.178	0.179	0.205	0.211

rate. These results together support our interpretation of the earlier results: total information production and use embedded in the interest rate improves after reform and when the branch president and loan officer are more familiar with each other.

D. Robustness Checks

Table X reports results of robustness tests on our main findings. To streamline the presentation, we report only the key interaction terms of interest. The first column checks models using the standardized interest rate as the dependent variable, and the second column checks models of loan outcomes. Panel A reproduces the key coefficients from Tables IV, VI, VIII, and IX for ease of comparison.

In our first robustness test in panel B, we consider whether changes in the post-reform period related to banking sector competitiveness can explain our results. More competition could pressure banks to produce better information, regardless of banks' internal changes and reforms. To test for this possibility, we include the (log of) the number of lending institutions near the borrower (at the zip code level), the interaction between this variable and the post-reform indicator, and the interaction between this variable and the credit rating. We obtain similar results (magnitudes and levels of significance) for both dependent variables, for the effect of the credit rating on loan terms and outcomes as well as for the effect of loan terms on outcomes.

In our second test in panel C, we control for the number of past loans between the bank and the borrower. Longer relationships likely strengthen information flows between borrowers and banks, thus potentially tightening links between credit ratings and loan terms and outcomes (Chang et al. (2014)). We therefore include the log of one plus the number of past loans, as well as the interaction between this variable and the credit rating, in all of the models. This test also checks whether the expansion in the number of loans in the post-reform period drives our findings. (We also tried dropping all borrowers that did not receive at least one loan in the pre-reform period and find similar results to those

Table X
Robustness Tests

This table reports robustness tests for links between the credit rating and standardized interest rates (the interest rate standardized by the cross-sectional standard deviation in that year) and the loan outcome (equals one if full repayment and zero otherwise). Credit ratings vary from one (riskiest) to eight (safest). We only report the key interaction term from the earlier models, so each coefficient below represents one regression. Panel A reproduces the coefficients of interest from our baseline models (Table IV, column 4; Table V, column 8; Table VIII, columns 2 and 4; Table IX, columns 2 and 4). Panel B adds the number of lending institutions in the same local market as the branch making the loan and its interaction with the post-2003 indicator or time worked together. Panel C adds the number of past loans made with the borrower and its interaction with the post-2003 indicator or time worked together. Panel D drops SOEs from the sample. Panel E reports results for the sample of SOEs. Standard errors are clustered by borrower. Robust z-statistics or t-statistics appear in parentheses below the coefficients; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

	Std. Interest Rate	Loan Outcome
	(1)	(2)
Panel A. Prior Results		
Post*Credit rating	−0.063***	0.019***
	(−3.427)	(3.928)
Coastal*Post*Credit rating	−0.036***	0.006
	(−2.671)	(1.621)
Time worked together*Credit rating	−0.029**	0.008**
	(−2.091)	(2.082)
Post*Std. interest rate	−	−0.030***
	−	(−3.683)
Coastal*Post*Std. interest rate	−	−0.005**
	−	(−2.097)
Time worked together*Std. interest rate	−	−0.014**
	−	(−2.028)
Panel B. Control for Number of Competing Banks		
Post*Credit rating	−0.063***	0.019***
	(−3.473)	(3.884)
Coastal*Post*Credit rating	−0.034**	0.006
	(−2.539)	(1.610)
Time worked together*Credit rating	−0.028**	0.008**
	(−2.024)	(2.007)
Post*Std. interest rate	−	−0.033***
	−	(−3.935)
Coastal*Post*Std. interest rate	−	−0.005*
	−	(−1.935)
Time worked together*Std. interest rate	−	−0.013*
	−	(−1.758)
Panel C. Control for the Number of Past Loans		
Post*Credit rating	−0.032*	0.019***
	(−1.783)	(3.834)
Coastal*Post*Credit rating	−0.040***	0.005
	(−2.976)	(1.269)
Time worked together*Credit rating	−0.030**	0.006*
	(−2.087)	(1.700)
Post*Std. interest rate	−	−0.030***
	−	(−3.666)
Coastal*Post*Std. interest rate	−	−0.004*
	−	(−1.660)
Time worked together*Std. interest rate	−	−0.013*
	−	(−1.862)

Annotations linking rows to prior tables: "Table IV, col. 4 →" points to Post*Credit rating; "Table VI, col. 8 →" points to Time worked together*Credit rating; "← Table VIII, col. 2" points to the Loan Outcome Post*Credit rating; "← Table VIII, col. 4" points to Time worked together*Credit rating (Loan Outcome); "← Table IX, col. 2" points to Coastal*Post*Std. interest rate; "← Table IX, col. 4" points to Time worked together*Std. interest rate.

(*Continued*)

Table X—*Continued*

	Panel D . Drop SOEs	
Post*Credit rating	−0.046**	0.013**
	(−2.214)	(2.533)
Coastal*Post*Credit rating	−0.049***	0.006
	(−3.363)	(1.604)
Time worked together*Credit rating	−0.032*	0.005
	(−1.885)	(1.298)
Post*Std. interest rate	−	−0.028***
	−	(−2.970)
Coastal*Post*Std. interest rate	−	−0.007***
	−	(−2.739)
Time worked together*Std. interest rate	−	−0.016**
	−	(−2.147)
	Panel E. SOEs	
Post*Credit rating	−.092***	0.041***
	(−2.590)	(3.724)
Coastal*Post*Credit rating	0.028	0.004
	(0.661)	(0.436)
Time worked together*Credit rating	0.002	0.019
	(0.075)	(1.518)
Post*Std. interest rate	−	−0.045***
	−	(−2.637)
Coastal*Post*Std. interest rate	−	−0.001
	−	(−0.178)
Time worked together*Std. interest rate	−	0.043**
	−	(1.960)

reported here.) We find that the key coefficients of interest remain unchanged, in terms of both magnitude and statistical significance.

In our final robustness test, we split the sample into non-SOEs versus SOEs in panels D and E, respectively.[23] Most SOEs, like state-owned banks, went through the same (partial) privatization process, including being listed on domestic and foreign stock exchanges over the past two decades. In our main tests, we include *SOE* and *Private* indicators to allow intercepts to differ by the type of borrower ownership. Recall that the results in Table IV suggest that firms with some government ownership (SOEs and the omitted group) borrow at lower rates than private enterprises, controlling for observable measures of risk; this subsidy to rates did not change significantly after reform (coefficient not reported). The results in panels D and E of Table X, however, suggest that the improvement in the production and use of information by the bank in making lending decisions improved post-reform, irrespective of borrower type.

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[23] About 18% (28%) of the loans in the post-reform (pre-reform) period are extended to SOEs (Table I, panel A); 19% of the 2,597 loans in the post-reform period for which we have data on individual work experience are extended to SOEs.

III. Conclusions

In this paper, we examine how different organizational and incentive structures affect the production and use of information. To do so, we use data from China, where the banking sector had 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 implemented a series of reforms focusing on decentralization—shifting lending decisions from committees to the individuals responsible for processing and approving loan applications. These reforms constitute a plausibly exogenous shock that improved incentives to produce high-quality information. In particular, we link detailed loan-level data on interest rates and default outcomes from a large state-owned bank to job histories of lending officers and branch presidents. These data allow us to construct a proxy for communications costs between a lending officer (the information producer) and the branch president (the decision-making authority) based on how long the two have worked together.

We show that the production and use of information improves as authority is delegated to lending officers and as communications costs between loan officers and higher management fall. Specifically, banks place more weight on their internally generated credit ratings after reform and when these ratings are produced by a lending officer who has greater time overlap with the branch president. We next show that both the credit rating *and* loan interest rate better predict loan performance after reform and as communication costs fall. The results suggest that better incentives and lower communications costs improve information production and use, which, in turn, expands the supply of credit and improves (lending) outcomes.

Appendix

How Are Internal Ratings Produced? Two Case Studies

Case 1:

Company A, a state-owned company, has been in the copper industry since 1954. Facing increasingly fierce competition, the company's performance has been slipping since 2000: sales and profits dropped, losses started to pile up, and leverage rose. Over the past few years it delayed repayment on several bank loans, losing its traditionally sound credit history and reputation. In 2005, Company A applied for a new loan (for restructuring). 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 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 the company's 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 partially owned by the local government, had been struggling due to weakening demand for its products. Its financial condition also worsened and the company sought a new loan from the bank to meet 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 they would not likely be able to convince the loan officers of the company's current creditworthiness. Given the strategic importance of the company, several officials did try to convince senior officials of the bank branch that handled the loan application.

Bank branches do not always have the final say in 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 at smaller branches throughout the state, it is important to have the support of government officials in the smaller cities and counties where the lending activities occur. Moreover, many city and county governments have considerable budget surpluses and there is fierce competition among financial institutions to win over (the depository services of) "special" customers.

Perhaps due to the persistent 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 helped pave the way for the approval of the loan from the superior branch. However, Company C's fortunes did not turn around and the company defaulted on the loan.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix S1: Internet Appendix.