

The Effects of Loan Officers' Compensation on Loan Approval and Performance: Direct Evidence from a Corporate Experiment

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Abstract

To understand better the role of loan officers in the origins of the financial crisis, we study a controlled experiment conducted by a large bank. In the experiment, the incentive structure of a subset of small business loan officers was changed from fixed salary to commission-based compensation. We use a diff-in-diff design to show that while the characteristics of loan applications did not change, commission-based loan officers are 19% more likely to accept loan applications, and approve loan amounts larger by 23%. Although the observable credit quality of loans booked by commission-based loan officers increased, they were 28% more likely to default. We show that the increase in default occurs primarily at the population of loans that would not have been accepted in the absence of commission-based compensation. Our results show that the explosion in mortgage volume during the crisis and the deterioration of underwriting standards can be partly attributed to the incentives of loan officers.

Keywords: loan officers, lending, banks, loans, default, financial crisis

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1. Introduction

A growing literature finds evidence linking the creation of the real-estate bubble in the early 2000s to misaligned incentives of intermediaries (e.g., Keys, Mukherjee, Seru, and Vig 2010, Ben-David 2011a, 2011b, Berndt, Hollifield, and Sandas 2010). In the lending process, loan officers may overbook risky loans if their incentives are misaligned with those of the lender and there is information asymmetry (Udell 1989, Berger and Udell 2002). The agency problem in the lending process is created because there is a separation between the lending decision (made by the loan officer) and the capital used (of the lender), and because the lending decision depends on information that is neither observable nor verifiable by the lender.¹ Although the problem can be mitigated by aligning incentives (e.g., by loan officers having an equity stake in the transaction, see Sufi 2007), in practice, compensation of most loan officers is some combination of fixed salary and a bonus based on booked volume (Bureau of Labor Statistics, 2010). While the agency problem in the lending process has been known for decades, it is hard to measure its economic impact in isolation from other environmental effects. The importance of understating the role of incentives to loan officers is especially acute given the claims² that lending was too aggressive during the period leading to the financial crisis.

In this paper, we present novel and *direct* evidence showing that a change in the incentive structure of loan officers—from fixed salary to a commission-based compensation—causes loan officers to approve more loans and at higher amounts, leading to a significant decline in the credit quality of loans. Our findings are based on a controlled experiment conducted by one of the largest U.S. commercial banks (“the Bank”). Due to the diff-in-diff design of the study, we

¹ Note that the information problem exists also when loans are sourced by mortgage brokers and then sold to lenders, as often happens in the residential market.

² See also Morgenson, Gretchen, “Was there a loan it didn’t like?” *New York Times*, November 1, 2008.

are able to make causal statements about the effects of incentive compensation on the lending process.

The corporate experiment that we analyze was designed by the Bank for the purpose of examining the influence of commission-based compensation on loan origination output. For many years, the compensation of small business loan officers was fixed. As many organizations implemented volume-based compensation for loan officers (Bureau of Labor Statistics, 2010), the Bank's management decided to initiate in a controlled experiment in 2005 for half of the small business loan officers in order to explore the effects of this incentive system. The assignment of loan officers to groups was determined by the legacy human resources computer system they belonged to. Loan officers could not switch between the systems. While loan officers' assignment was not randomized, it was unrelated to their performance or prospects. Our dataset contains loan details for more than 30,000 small business loan applications received by more than 140 loan officers during the 24-month window around the change in incentives. Our research design is diff-in-diff; hence we detect the effects of incentive compensation by exploiting within-loan officer variation.

We begin the empirical analysis by reaffirming the conjecture that loan officer groups are comparable. Our analysis shows that the pool of applications for the treated and control groups are statistically indistinguishable in all loan characteristics (loan size, personal collateral, business collateral, requested LTV, business credit score, and personal credit score). Furthermore, we show that there is no difference in the decisions of two groups of loan officers in 2004, before the experiment began. These facts comfort us that the effects that we detect later are due to decisions of loan officers and not due to a difference in the quality of the applications or some unobserved quality of the loan officers.

We find that moving to incentive pay causes loan officers to accept more loans and to approve larger loan sizes. We find that loans are about 7% more likely to be accepted by loan officers in the treated group than by loan officers in the control (an increase of 19.4% in relative terms). Also, approved loan amounts by treated loan officers are larger by about 23%. Finally, we find that average external credit quality (measured by outside credit scoring firm) remains unchanged, and that the average internal credit score (calculated by the loan officers) actually increases. Put together, these results suggest that incentive pay leads loan officers to approve more loans, at greater amounts, within the observable credit guidelines of the bank.

Despite the increase in the perceived quality of loans, loan performance deteriorated. Specifically, we document that 12-month default probability increased by 1.2% percentage points for loans booked by treated loan officers (an increase of 27.9% in default in relative terms).

Perhaps the most important result of our paper is that treated loan officers exploit their informational advantage and book low quality loans and inflate their internal credit score. We show that the high likelihood of default for loans booked by the treated group can be explained away by the “unexplained” components of (1) the decision to accept loans, and (2) the internal risk score assigned by loan officers. Consistent with the predictions of Udell (1989) and Berger and Udell (2002), these findings indicate that treated loan officers use their discretion to knowingly accept poor quality loans and inflate their internal credit score.

In sum, our evidence shows that incentive pay for loan officers has two important ramifications. First, commission-paid loan officers originate loans more aggressively. Second, although the observable credit quality of booked loans did not deteriorate, the overall credit quality of loans is lower due to a decline in the *latent* credit quality. This means that incentive

pay causes loan officers to extract rents by exploiting their information advantage over the bank. More broadly, our results suggest that commission-based compensation to loan officers played an important role in the expansion of credit supply and the deterioration of underwriting standards during the credit boom in the early 2000s.

Our study relates to several streams of the literature. Several researchers find indirect evidence that misaligned incentives of intermediaries lead to transactions that otherwise would not have taken place. Keys, Mukherjee, Seru, and Vig (2010) show that the securitization process led to lax screening of borrowers. Ben-David (2011a, 2011b) finds that real-estate agents and mortgage brokers induce borrowers to artificially inflate transaction prices in order to gain access to larger mortgages, and to overpay for housing as well as to borrow at high leverage. Berndt, Hollifield, and Sandas (2010) document that there is a negative relation between quality of loans originated by mortgage brokers and the fees they earn.

Also, many studies examine the incentive provision to individuals in organizations.³ In the context of compensation contracts, the provision of incentives usually takes the form of pay-for-performance, or piece-rate contracts (Lazear and Rosen 1981, Stiglitz 1981, Holmström 1999, Green and Stokey 1983). While piece-rate payment has the effects of inducing appropriate effort levels and mitigate moral hazard problems (Lazear 1986), it may give rise to dysfunctional behavioral responses, where agents emphasize only those aspects of performance which are rewarded (Baker 1992). Following Holmström and Milgrom (1991) and Baker (1992), this incentive problem has become known as multi-tasking, where agents allocate effort toward those activities that are directly rewarded and away from uncompensated ones. On the empirical front, several studies examine the effects of incentives on performance. Lazear (1986) studies the

³ See Prendergast (1999) for an extensive survey.

performance of auto windshield workers and documents the incentive and worker selection effects of piece-rate contracts. Paarsch and Shearer (2000) find similar evidence using data on Canadian tree planters. Finally, Cole, Kanz, and Klapper (2010) use a pure experimental setting implemented on a group of loan officers from a commercial bank in India. They compare loan acceptance pattern and effort by loan officers as a response to different incentive schemes. Consistent with our results, they find that loans are more likely to be accepted when origination bonus is granted to loan officers; however, they do not examine loan performance and neither do they tie the effects to the information problem in lending.

The paper proceeds as following. Section 2 describes the experiment. Section 3 studies the origination patterns of loans. Section 4 analyzes the drives of loan performance. Section 5 offers some concluding remarks.

2 Corporate Experiment

2.1 A Bank Experimenting with Compensation Schemes

Loan officer compensation usually takes some combination of fixed payment salary and commission tied to the volume of booked loans (Bureau of Labor Statistics, 2010). Neither of these compensation schemes is tied to loan repayment, failure, or more broadly—the eventual profitability of these loans. Such compensation contracts may distort loan officers’ incentive and encourage them to make any loan, regardless of its quality.⁴ While commission that is based on loan profitability would have the advantage of giving direct incentives to search out good credit risks, it might also impose greater risk on loan officers, including risks beyond their control (e.g.,

⁴ The desire to originate any loan is offset by career concerns of loan officers and loan acceptance guidelines of the bank (based on hard information).

market crash). Such contracts are likely to entail higher wages compensating for the higher risk born by loan officers. Baker (2002) argues that the trade-off between risk and distortion in this case is made in favor of lower risk and higher distortion.

In 2004, the management of the North East division of a large U.S. commercial bank decided to explore the possibility of changing the compensation scheme of small business loan officers from fixed salary to commission-based compensation system. Under the proposed program, loan officers would receive a low fixed salary, and a bonus that increases with the originated volume.

The bank intended to implement the commission-based scheme for the entire portfolio of loan officers, but we were able to convince the bank's management to implement the scheme in stages, so that we could try to study the new benefits of the new compensation scheme. In the first stage, starting January 2005, the new scheme was to be put into action in a subset of branches that administered their human resources issues through one of the legacy databases. Other branches, which were connected to another human resources database, maintained their old compensation scheme. Due to earlier acquisitions of other banks over years, the bank maintained two legacy databases that contain the loan officers' administrative data.

The assignment of the acquired banks' loan officers to each of the databases was essentially random, and hence the portfolio of loan applications received by the two groups of loan officers have identical underwriting standards, geographical focus, portfolio management practices, and loss outcomes prior to the change in the compensation structure (see Table 2 for analysis of application characteristics across the groups). Loan officers were not allowed to switch between the two systems.

The complete implementation of the commission-based scheme was supposed to take place in 2006, however, due to the poor results of the pilot of 2005, the management of the bank decided to roll back compensation to be fixed for the all loan officers, as in the pre-2005 period.

2.2 Loan Approval Process

To understand better the impact of loan officer compensation on the loan approval process, one needs to understand the process of approval itself. The branches of the bank offer retail services, and in each branch there a small number of commercial loan officers. The application process begins when a client, most of whom are small business owners, inquires with a loan officer about a potential loan for his business. In most cases, the loan officer encourages the client to submit an application for a review. On the application, the client states the requested amount, the collateral offered, and the purpose of the loan. Collateral may be owned by the business, or by the person applying for the loan.

The application is then processed by the loan officer. The loan officer verifies the information provided by the borrower and gathers additional information to assess the credit worthiness of the borrowers and the probability of repayment (e.g., the borrower's and business' credit rating with an external credit agency). Based on this information, the loan officer computes an internal risk rating measure, which ultimately determines the collateral requirements. A loan that would otherwise be denied may be approved if the client can provide the lender with appropriate collateral pledged as security for the repayment of a loan.

The application is then reviewed by the credit committee of the bank. The committee includes the loan officers of the branch, the credit manager at the branch, and the branch

manager. During the meeting of the committee, the case is discussed and the guidelines for the loan, if approved, are sketched. Unlike residential loans in which the lender approves or rejects the requested amount, commercial loans can be approved with an amount smaller than the amount requested. Upon approval the loan officer prepares an offer letter to the client with the details of the loan. The letter is reviewed and signed by the manager of the credit department.

Once offer letter is received by the client he may accept the terms, negotiate them, or withdraw the application. In 2004, about 31% of applications were eventually booked, 12% of applications were withdrawn, and the rest were rejected. All booked loans of small businesses were kept on the bank's balance sheet; none were securitized.

During the life of the loan, the loan officer administers the loan payments, loan renewals, and renegotiations. Whenever an issue arises, such as delinquency, the file is returned to the credit committee to discuss and decide about changes in the loan terms. For a more detailed description of the process, see Agarwal and Hauswald (2010).

2.3 Description of the Data

The dataset used in the study is an extract of the proprietary database used by the bank. The dataset includes information about all the applications submitted to the North-East division of the bank in 2004 and 2005. We define the control groups (Group A) as half of the branches that maintained the fixed salary compensation. In the treatment group (Group B), loan officers' compensation was fixed in 2004, and changed to being commission-based in 2005.

2.4 Empirical Identification

The advantage of the empirical setting in this study is that the change in compensation structure took place only in one group of loan officers, while the other group was continued to be compensated in a fixed salary as before. The fact that the two compensation schemes were active during the same period allows us to identify the effect of compensation using a diff-in-diff identification method. In this method, one uses time fixed effects, to defray any temporal systematic effects, as well controls for agent fixed effects, to control for their agents' average effect. Then, the interaction between the treatment group dummy and the time dummy of the studied effect (2005 dummy in our case) captures the direct effect of the treatment (called “commission-based compensation” dummy in our analysis).

For the effect of change in compensation to be properly identified based on the diff-in-diff method, we need to ensure that there are no confounding factors in the research design. In the current study, we are concerned with two issues. First, there is a possibility that the assignment to treatment and control was not random. Perhaps the group that was assigned to the treatment was different on some dimensions relative to the untreated group. Our conversations with the team responsible for the implementation of the program confirmed that the only consideration that was at play in choosing the group to be treated was the ease of implementation of the new scheme in the computer system. Furthermore, we perform three analyses to test this issue (described in more detail in Section 3.2). In Table 2, Panel B, we test whether applications are different from the treated group relative to the control groups. We find that there is no significant difference between the groups. Further in the Table 2 we test whether loan applications (Panel C) and booked loans (Panel D) were materially different between Groups A

and B in 2004, during the pre-experiment period 2004. The results show that there is no material difference between the applications and booked loans of the treated and control groups.

Second, there is a concern that the modification in the compensation structure is confounded with additional changes in the lending process. Specifically, one might worry that the change in compensation may be tied to a change in the underwriting model: for example, instead of the bank holding the loans on its balance sheet, the bank may decide to start securitizing them. Such action might encourage loan officers to relax their underwriting standards (see Keys, Mukherjee, Seru, and Vig 2010). To nullify this possibility, we performed a depth interview with the managers of the programs, and were assured that there were no additional structural changes in the lending process in parallel with the implementation of the compensation program.

Another channel for confounding effects relates to expectations by loan officers. That is, a change in compensation could be interpreted by loan officers as an implicit instruction from management to increase the volume and size of booked loans. Hence, the observed changes in the behavior of loan officers may not be a direct response to the change in their compensation structure, but rather a response to the implicit instructions by management, communicated through the change in compensation.

While it is hard to separate the effects of the compensation scheme from the implicit expectations it creates, there are several facts that make it hard to believe that the change in behavior is created by loan officers' interpretation of management's intentions. The first fact is that while the internal risk score improved following the change in compensation, default rate increased by 27.9%. This pattern cannot be explained by loan officers catering to an implicit higher demand for originations. The second fact is that the new commission-based compensation

system was public knowledge across the bank. Hence, we would anticipate that an interpretation of the pilot program as management attempting to boost originated volume, would be common to treated and control groups. The third fact is that the increase in default rate is not compensated by higher interest rates charged to these loans; hence, it is unlikely that the bank has changed its assessment of risk differentially for treated and control groups. Finally, the commission-based compensation program was considered a failure and scrapped at the end of 2005. The bank's management was not satisfied with the increased in default rate and decided to roll back the compensation scheme to a flat structure. Thus, the management revealed its intentions *ex post* as being disappointed by the decline in the quality of the loan book.

To summarize, our conclusion is that the diff-in-diff identification strategy is appropriate to study the effects of compensation structure on the behavior of loan officers. Our identification is particularly strong as we control for loan officer fixed effects, meaning that the effects we identify are within-loan officer effects.

3 Empirical Analysis

3.1 Summary Statistics

We begin our analysis with examining the summary statistics. Due to the large magnitude of the results and the diff-in-diff research design, most of the effects reported in this paper can be observed through the summary statistics. For the purpose of describing the data, we split the data according to 2×2 matrix: 2004 vs. 2005, and Group A vs. Group B. The treatment group includes loan officers from Group B in 2005. The control group consists of loan officers from Group A in 2004 and 2005, as well as of loan officers from Group B in 2004.

The summary statistics are provided for applications and for booked loans separately. In Table 1, Panel A, we present summary statistics for loan applications. Requested loans are about \$450,000. About 26% of the applications are proposed to be supported by personal collateral, and 74%—by business collateral. In terms of credit quality, applicants are on average of high quality. The average business Experian score is about 198 (out of a range of XXX to XXX), and the personal Experian credit score is around 728 (out of a range of XXX to XXX).

The summary statistics reveal sharp difference between the control and treatment groups for the booked loans, in Table 1, Panel b. First, while the acceptance rate is about 31-36% for the control groups, it is 47% for the treatment group. Second, the approved loan amount is higher by about 20% for the treatment group relative to the control. Third, the approved leverage of loans booked by treated loan officers is significantly higher than that booked by the control group: 84% vs. 74%. Fourth, while the average credit score of borrowers is higher for the treated group (business score: 196 (treatment) vs. 185 (control), and personal score: 725 (treatment) vs. 718 (control)), default rate within 12 months is materially higher for the treatment groups (5.2% vs. 4.2%).

Next, we turn to diff-in-diff tests to measure the magnitude of the effects with controls.

3.2 Verifying the Validity of the Diff-in-Diff Assumptions

The diff-in-diff framework requires that the treated and control groups will be statistically similar in all dimensions except for the dimension that is manipulated. In this section we verify that the characteristics of applications received by Groups A and B are statistically indistinguishable, and that in the pre-treatment period (2004) loan officers' decisions are similar.

Such evidence would provide comfort that the groups are comparable, and thus the outcomes of the approval process in the treatment group (e.g., higher default rate in the treated group) can be attributed to the change in the compensation scheme.

We perform several types of tests. The first test examines the volume of applications that reaches each group of loan officers. In Table 2, Panel A, we count the monthly number of applications, as well as aggregate the dollar volume of these applications for each loan officer. Then, we regress these figures on loan officer fixed effects as well as on month fixed effects. The results show that point estimates of application volume in the treated group are higher by 1% to 2%, however, they are statistically not indistinguishable from zero.

The next analysis, in Table 2, Panel B, tests for whether specific loan characteristics are the same between the control and treated groups. As in all regressions, we control for loan officer fixed effects, as well as for fixed effects for industry and calendar month. The panel shows that all loan characteristics are statistically indistinguishable between the treatment and the control: logged amount requested, requested loan-to-value, personal collateral dummy, external (Experian) business, personal credit score, and internal risk rating.

Overall, the results in this section suggest that there are no material difference between the treated group and the control groups. This result provides comfort about that the difference between the characteristics of booked loans and their performance can be attributed to the change in the compensation scheme.

3.3 An Increase in the Volume of Booked Loans

We continue with analyzing the volume and characteristics of booked loans. In Table 3, Panel A, we compute the aggregate booked volume, as well as the total number of booked loans at the loan officer-month level. We regress these amounts on commission-based compensation dummy, in addition to loan officer and calendar month fixed effects. The regressions show that following the change in the compensation scheme, the number of booked loans increased by about 12%, and the dollar volume increased by about 8%-9%.

Next, we move to the loan level to test the change in the likelihood of loan booking following the change in compensation. In Table 3, Panel B, we use the sample of all loan applications, and regress an indicator for whether an application was accepted. We control for loan characteristics and for loan officer, industry, and calendar month fixed effects. The results show that the likelihood of accepting a loan following the change in compensation is higher by about 7%.

Overall, these results are consistent with the conjecture that variable compensation causes loan officers to accept more loans.

3.4 An Increase in the Likelihood of Approval and in the Approved Amounts

Given that the volume of booked loans increased following the treatment, we turn to testing whether loan approval patterns (e.g., approved amount, risk measures) changed following the treatment. Table 1 and Figure 2 show that the average loan size increased by 23% (from \$253,219 to \$312,518).

In Table 4, Column (1), we regress the log difference between the approved amount and the requested amount, on the commission-based compensation dummy in addition to loan characteristics and fixed effects, as before. The regression shows that approved loan amounts are higher by 3.2% for loans that were approved by treated loan officers. In Column (2), we regress the difference between the approved LTV and the requested one. Similarly to the result in Column (1), approved LTV by treated loan officers is higher by 2.2%. This result suggests that treated loan officer approve larger loans that are not compensated by larger collateral. In column (3) we test whether interest rates are different between the control and the treatment. The result shows that interest rates are higher for the treatment group by a statistically insignificant 0.01%.

In Column (4) through (6) we examine external and internal risk scores. Columns (4) and (5) show that the external credit score is statistically indistinguishable between the control and the treatment for both the business and personal measures. Column (6) shows that the internal risk rating of booked loans is higher by about 0.05 (out of a scale of 1 to 5). This result is surprising given the fact that default rate is higher for loans booked by this group. In Section 3.6, we discuss this issue further.

Overall, the results in Table 4 indicate that following the change in compensation approved loans are larger in size and with higher leverage. There is no material difference in interest rates or the external risk scoring of booked loans.

3.5 Deterioration in Loan Performance

Measuring the effect of the change in loan officer compensation on loan performance is instrumental to understanding the channels through which incentives affect the lending process.

In particular, the results so far, that the change in compensation led to higher originated volume, allude to two possible stories. The first story is that the change in compensation induces loan officers to work harder, gather better information about borrowers, and approve more loans. In this case, we expect that default of borrowers can be explained by loan fundamentals. Alternatively, it is possible that loan officers approve some loans that appear on paper as quality loans, however, are of poor quality based on soft information. By doing so, loan officers exploit the information advantage they have on the bank. The prediction of this explanation is that default cannot be explained by fundamentals, but rather with proxies of soft information.

3.5.1 Measuring the Increase in Default

We measure the default event as 90 day delinquency within one year of the booking the loans. Raw average default rate in the control groups is 4.2%, while it as high as 5.2% in the treated group in 2005 (Table 1, Panel B). To verify that this difference is statistically different, we regress a default indicator on the commission-based compensation dummy in addition to loan officer, industry, and calendar month fixed effects. At this point we are interested to measure the difference in default rates without controlling for borrower and loan characteristics. The results in Table 5, Columns (1) and (2), show that the default rate of the treated group is higher by 1.2 percentage points (1.2% increase relative to the base rate default rate of 4.3% of the control group in 2005). In Columns (3) and (4) we control also for the interest rate charged to the loans (all loans are adjustable rate loans). This control should capture the *ex ante* risk as perceived by the bank. The regressions reveal that the coefficient on the commission-based compensation dummy remains virtually unchanged with this additional control. This result suggests that the increase in default rate is not priced in the booked loans.

To summarize, the default rate is higher for the treated group following the implementation of the commission-based compensation scheme by 27.9% relative to the base rate default rate. It appears that this extended risk is not sufficiently compensated for by higher interest rates.

3.5.2 Loan Officers Trying Harder or Exploiting Soft Information

To understand the real effects of the commission-based compensation plan on the behavior of loan officers, one needs to explore the channels through which loan performance changes following the change in compensation. We propose two non-exclusive mechanisms that could contribute to the increase in the rate of borrower default. First, the commission-based compensation scheme encourages loan officers to approve larger loans and require larger collateral (see Section 3.4). The net result is an increase in the leverage of borrowers, and consequently higher risk of default. According to this explanation, the driver of the increase in default is the change in the riskiness of the loans due to higher leverage.

Second, there is a possibility that the credit quality of the booked loans following the change in the compensation scheme is fundamentally higher (i.e., beyond the increase in leverage) than that of the booked loans in the control groups due an agency problem.⁵ The reason for the decline in the quality of loans is that the high power compensation scheme encourages high volume origination, however, does not directly penalize for reckless underwriting. Hence, loan officers have the incentive to accept loans that are within the underwriting guidelines of the bank (defined by hard information such as credit scores), even if they know that the quality of

⁵ See Udell (1989) and Berger and Udell (2002) for a discussion of the agency problem between a commercial bank and its loan officers.

borrowers is low, based on soft information that they collect. Thus, the prediction of this explanation is that borrower default is correlated with negative soft information that loan officers possess, and thus is not captured in hard information.

To test these explanations, we return to the default regressions presented in Table 5. We are interested now to explain away the coefficient on the commission-based compensation dummy. We begin with testing the idea that a change in borrower characteristics, and particular an increase in leverage, is responsible for the increase in the default rate. In Table 6, Panel A, Columns (1) and (2) present the base line regression: the first column shows the default regression with no controls, whereas in the second column we add controls (except for leverage). The regressions show that changes in the external and internal credit quality, loan size, and collateral composition do not materially affect the coefficient on the commission-based compensation dummy. Next, in Column (3), we add the leverage and leverage squared to the regression. The column shows that the size of the commission-based compensation dummy declines nominally from 1.20% in Column (1) to 1.17% in Column (3). This is an important result as it suggests that the increase in approved loans' leverage is not a primary driver of the increase in the likelihood of default.

To test the second explanation, that following the change in the compensation structure booked loans contain more negative soft information, we add to the regression a proxy for soft information. To generate this variable we rely on the idea that the external credit risk ranking is independent of the change in compensation, while the internal credit risk ranking is determined endogenously by loan officers and therefore could potentially be affected by the loan officers' compensation. If the internal risk rating is substantially higher than the external risk rating, it may indicate that the loan officer attempts to push the loan strongly internally.

We implement this idea by regressing the internal risk rating on the fundamentals of booked loans and computing the residual. Specifically, we control for the logged requested amount, personal collateral indicator, LTV, LTV-squared, Experian business score, Experian personal score, in addition to loan officer, industry, and calendar month fixed effects. We present this regression in the Appendix, Table A3. The residual from this regression reflects the difference between the internal risk rating as determined by the loan officer to the predicted internal risk rating based on fundamental. A high residual could potentially mean that the loan officer “inflates” the rating.

We test whether loan officers use power to accept loans by inflating their internal risk rating. To do so, we return to the applications sample, and test whether the residual from the internal rating regression can explain away the increase in loan acceptance rates in the treatment group. In Table 6, Panel A, we regress loan booking indicator on commission-based compensation dummy in addition to fundamental loan characteristics (Columns (1) and (2)). In Column (3), we control for the residual from the internal risk rating regression. The coefficient declines by about 10%—from 7.07% to 6.33%.

Next, we examine whether the asymmetric information channel can explain the excess default rate of loans booked by treated loan officers. In Table 6, Panel B, Columns (1) to (3), we present the base regressions. Column (1) shows that loans booked by commission-based loan officers are more likely to default by 1.20% (about 28% increase relative to the control groups). Column (3) shows that after including controls, the effect of the treatment reduce to 1.15% (statistically insignificant decline). In Column (4) we add the residual from the booking regression. This variable is statistically significant in the regression and reduces the coefficient on the commission-based compensation to 0.84%. In Column (6) we add the residual from the

internal rating regression; it is also statistically significant, and together with the residual of the booking regression, both reduce the coefficient on the commission-based compensation variable to a statistically insignificant 0.59%—a reduction of 50%. Thus, the residuals from the booking and internal ratings regressions explain 50% of commission-based compensation coefficient. This is evidence that the discretion of loan officers with commission-based compensation accounts for the increase in loan default.

To summarize the results in this section, these results show that the heightened default rate for the treatment group does not occur because loans booked by treated loan officers are larger and more highly leveraged, but rather because the commission-based compensation incentivizes loan officers to knowingly accept loans that appear good on paper, but are of poor credit quality based on soft information. This result means that the increase in default occurs primarily at the population of loans that would not have been accepted in the absence of commission-based compensation.

4 Conclusion

In this paper we present direct evidence that commission-based compensation causes loan officers to overbook risky loans. This result is particularly contributing to our understanding the role of incentives in brewing the real-estate bubble in the early 2000s. Our results show that compensation scheme of loan officers was likely to

The paper presents novel and direct evidence about the effects of loan officer compensation on characteristics of accepted loans about their unobserved quality. The results show loans that are accepted under a compensation regime that ties compensation to volume

leads to a higher volume of loans, at higher leverage, however, at lower quality. Importantly, we document that the decline in quality is both on observable level (e.g., external and internal credit ratings), as well as on unobserved level.

Our results support the view that intermediaries had an important role in propagating the real-estate bubble in the early 2000's, partly because their incentives are misaligned. It is important to note that the compensation scheme examined here is not different from the scheme was accepted during those years at most lenders (see, Bureau of Labor Statistics 2010, and Berndt, Hollifield, and Sandas 2010).

References

- Agarwal, Sumit, and Robert Hauswald, 2010, Distance and Private Information in Lending, *Review of Financial Studies* 23(7), 2757-2788.
- Baker, George P., 1992, Incentive Contracts and Performance Measurement, *Journal of Political Economy* 100(3), 598-614.
- Baker, George P., 2002, Distortion and Risk in Optimal Incentive Contracts, *Journal of Human Resources* 37(4), 728-751.
- Ben-David, Itzhak, 2011a, Financial Constraints and Inflated Home Prices during the Real-Estate Boom, *American Economic Journal: Applied Economics*, forthcoming.
- Ben-David, Itzhak, 2011b, High Leverage and Willingness-to-Pay: Evidence from the Residential Housing Market, Working paper, The Ohio State University.
- Berger, Allen N., and Gregory F. Udell, 2002, Small Business Credit Availability and Relationship Lending: The Importance of Bank Organizational Structure, *Economic Journal* 112, 32-53.
- Berndt, Antje, Burton Hollifield, and Patrik Sandas, 2010, The Role of Mortgage Brokers in the Subprime Crisis, Working paper, Carnegie Mellon University.
- Bureau of Labor Statistics, 2010, Loan Officers, in Occupational Outlook Handbook, 2010-11 Edition, U.S. Department of Labor, <http://www.bls.gov/oco/ocos018.htm>.
- Cole, Shawn, Martin Kanz, and Leora Klapper, 2010, Rewarding Calculated Risk-Taking: Evidence from a Series of Experiments with Commercial Bank Loan Officers, Working paper, Harvard Business School.
- Green, Jerry R., and Nancy L. Stokey, 1983, A Comparison of Tournaments and Contracts, *Journal of Political Economy* 91(3), 349-364.
- Holmström, Bengt, 1999, Managerial Incentive Problems: A Dynamic Perspective, *Review of Economic Studies* 66, 169-182.
- Holmström, Bengt, and Paul Milgrom, 1991, Multitask Principal Agent Analyses: Incentive Contracts, Asset Ownership and Job Design, *Journal of Law, Economics and Organizations* 7: Special issue, 24-52.
- Inderst, Roman, 2008, Loan Origination under Soft- and Hard-Information Lending, Working paper, University of Frankfurt.
- Keys, Benjamin J., Tanmoy Mukherjee, Amit Seru, and Vikrant Vig, 2010, Did Securitization Lead to Lax Screening? Evidence from Subprime Loans, *Quarterly Journal of Economics* 125(1), 307-362.
- Lazear, Edward P., 1986, Salaries and Piece Rates, *Journal of Business* 59(3), 405-431.
- Lazear, Edward P., and Rosen, Sherwin, 1981, Rank-Order Tournaments as Optimum Labor Contracts, *Journal of Political Economy* 80, 841-864.
- Paarsch, Harry and Bruce Shearer, 2000, Fixed Wages, Piece Rates, and Incentive Effects: Statistical Evidence from Payroll Records, *International Economic Review* 41(1), 59-92.

Petersen, Mitchell A., Information: Hard and Soft, Working paper, Northwestern University.

Prendergast, Canice, 1999, The Provision of Incentives in Firms, *Journal of Economic Literature* 37(1), 7-63.

Stiglitz, Joseph, 1981, Contests and Cooperation: Towards a General Theory of Compensation and Competition, Unpublished manuscript, Princeton University.

Sufi, Amir, 2007, Information Asymmetry and Financing Arrangements: Evidence from Syndicated Loans, *Journal of Finance* 62(2), 629-668.

Udell, Gregory F., 1989, Loan Quality, Commercial Loan Review and Loan Officer Contracting, *Journal of Banking and Finance* 13(3), 367-382.

Appendix A: Variable Definition

Variable	Description
<i>Requested amount</i>	The dollar amount requested by the loan applicant.
<i>Booked amount</i>	The dollar amount that was booked by the bank.
<i>Personal collateral</i>	An indicator variable to whether the loan applicant proposes to collateralize a personal asset (=1); otherwise, the loan applicant proposes to collateralize a business asset (=0).
<i>Loan-to-value (LTV)</i>	Computed as the loan amount divided by value of the collateral, multiplied by 100.
<i>Experian business score</i>	Applicant's business credit score, as reported by Experian. Score ranges from XXX to XXXX. High score means higher credit quality.
<i>Experian personal score</i>	Applicant's personal credit score, as reported by Experian. Score ranges from XXX to XXXX. High score means higher credit quality.
<i>Internal risk rating</i>	Applicant's risk rating as computed by the loan officer. Score ranges from 1 to 5. Unlike Experian scores, low internal risk rating reflects higher credit quality.
<i>Withdrawn</i>	An indicator to whether a loan application was withdrawn before or after a decision was made by the bank.
<i>Commission-based compensation</i>	An indicator to whether: 1) the loan application was handled by a loan officer is part of Group B (treated with commission-based compensation in 2005), and 2) the year of loan application is 2005.
<i>Interest rate</i>	The interest rate paid on the loan.
<i>Default within 12 months</i>	An indicator to whether the loan became delinquent (60 days past due or more) within 12 months since booking.
<i>Loan booked</i>	An indicator to whether a loan application was booked by the bank.
<i>Residual from loan booking regression</i>	Residual from a regression the loan booked variable on loan characteristics (See Appendix B).
<i>Residual from loan booking regression</i>	Residual from a regression the internal risk rating variable on loan characteristics (See Appendix B).

Appendix B: Booking and Internal Risk Rating Regressions (First Stage Regressions)

	Loan booked (0/1)	Internal risk rating
	(1)	(2)
log(Requested amount)	-0.0494*** (0.0192)	0.0283** (0.0132)
Personal collateral	0.0511*** (0.0110)	-0.1230*** (0.0341)
LTV	-0.0413*** (0.0116)	0.0354*** (0.0054)
LTV ²	-0.1480*** (0.0472)	0.1227*** (0.0165)
Experian business score	0.0748*** (0.0288)	-0.0073*** (0.0011)
Experian personal score	0.0699*** (0.0145)	-0.0080*** (0.0012)
Loan officer fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
Month fixed effects	Yes	Yes
Observations	30,268	11,164
Adj. R ²	0.21	0.31

Table 1. Summary Statistics

The table presents summary statistics for the data used in the study. Panel A presents summary statistics for loan applications. Panel B presents summary statistics for the booked loans. Variables are defined in Appendix A.

Panel A: Loan Applications

	2004				2005			
	Group A (Control)		Group B (Control)		Group A (Control)		Group B (Treatment)	
	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
# Applications	6920		7996		7564		7788	
Amount	\$455,240	\$336,805	\$426,480	\$378,698	\$454,141	\$369,635	\$444,137	\$381,829
Personal collateral (0/1)	0.255	0.436	0.261	0.439	0.280	0.449	0.239	0.427
LTV	61.28	43.00	65.30	44.03	65.16	46.87	63.05	43.48
Experian business score	200.86	72.23	195.88	75.87	195.99	75.27	200.36	68.47
Experian personal score	731.85	70.31	725.41	68.06	725.91	74.39	728.06	76.72
Withdrawn (0/1)	0.132	0.338	0.118	0.322	0.150	0.357	0.119	0.324

Panel B: Booked Loan

	2004				2005			
	Group A (Control)		Group B (Control)		Group A (Control)		Group B (Treatment)	
	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
# Booked loans	2192		2548		2744		3680	
% Loans booked	30.55	46.10	32.19	46.75	35.74	49.92	46.56	47.59
Amount (requested)	\$302,074	\$305,891	\$302,966	\$301,933	\$303,082	\$306,939	\$302,224	\$317,073
Amount (booked)	\$224,614	\$279,361	\$216,048	\$229,403	\$253,219	\$257,801	\$312,518	\$404,976
Personal collateral (requested) (0/1)	0.206	0.473	0.199	0.382	0.191	0.379	0.198	0.401
Personal collateral (booked) (0/1)	0.272	0.417	0.253	0.436	0.285	0.452	0.113	0.456
LTV (requested) (%)	79.06	20.93	78.44	19.28	79.03	17.04	78.52	18.4
LTV (booked) (%)	72.99	31.48	76.24	30.90	74.90	33.10	84.10	50.10
Experian business score	184.87	68.95	186.11	78.92	185.50	93.09	196.09	87.01
Experian personal score	716.69	87.44	718.90	88.58	719.54	98.25	725.77	66.51
Internal risk rating	5.23	1.84	5.38	1.52	5.44	1.3	4.93	1.53
Interest rate (%)	9.91	5.02	9.85	4.89	9.58	4.88	9.65	4.93
# Defaults	91		107		119		192	
Default (0/1)	0.042	0.199	0.042	0.201	0.043	0.204	0.052	0.222

Table 2. Analysis of Loan Application Volume and Characteristics

The table presents analysis of loan applications volume and characteristics. Panel A uses a sample at the loan officer-month level and explore whether the dollar volume and the number of applications are different for applications made to loan officers who receive commission-based compensation. Panel B tests whether characteristics of loan applications for loan officers are different for applications made to loan officers who receive commission-based compensation. Panel C tests whether loan applications received by Group A (control) and by Group B (to be treated in 2005) are different in the pre-treatment period (2004). Panel D tests whether booked loan made by Group A (control) and by Group B (to be treated in 2005) are different in the pre-treatment period (2004). All regressions are OLS regressions. Variables are defined in Appendix A. In Panel A standard errors are clustered at the month level. In Panels B to D standard errors are clustered at the loan officer level. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Loan Application Volume in Treated and Control Groups

	Applications (monthly)			
	log(Volume (\$))		log(# applications)	
	(1)	(2)	(3)	(4)
Commission-based compensation	0.0193 (0.0574)	0.0143 (0.0556)	0.0118 (0.0864)	0.0101 (0.0831)
Loan officer fixed effects	Yes	Yes	Yes	Yes
Month fixed effects	No	Yes	No	Yes
Observations	30,268	30,268	30,268	30,268
Adj. R ²	0.11	0.18	0.12	0.17

Panel B: Characteristics of Loan Applications in Treated and Control Groups

	log(Requested amount)	Requested LTV	Personal collateral	Experian business score	Experian personal score	Internal risk rating
	(1)	(2)	(3)	(4)	(5)	(6)
Commission-based compensation	0.0166 (0.0654)	0.0262 (0.1854)	0.0143 (0.0572)	0.0254 (0.0517)	0.0303 (0.1153)	0.0447 (0.1389)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Loan officer fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	30,268	30,268	30,268	30,268	30,268	30,268
Adj. R ²	0.16	0.14	0.18	0.07	0.15	0.17

Table 2. Analysis of Loan Application Characteristics (Cont.)

Panel C: Loan Applications in Groups A and B in 2004

	<u>log(Requested amount)</u>	<u>Requested LTV</u>	<u>Personal collateral</u>	<u>Experian business score</u>	<u>Experian personal score</u>	<u>Internal risk rating</u>
	(1)	(2)	(3)	(4)	(5)	(6)
Group B (to be treated in 2005)	-0.0184 (0.0379)	-0.0195 (0.0467)	0.0014 (0.0143)	0.0011 (0.0064)	-0.0023 (0.0057)	0.0038 (0.0069)
log(Requested amount)		0.0279*** (0.0088)	0.0367*** (0.0109)	-0.0114 (0.0094)	-0.0061 (0.0114)	0.0040 (0.0190)
Personal collateral	0.0339 (0.0581)	0.0031 (0.0173)	-0.0275 (0.0265)	0.0257 (0.0206)	0.0187 (0.0223)	-0.0070 (0.0411)
LTV	-0.0160*** (0.0006)		0.0187*** (0.0061)	0.0361 (0.0373)	0.0006** (0.0003)	0.0020 (0.0080)
LTV ²	-0.0432*** (0.0004)		0.0385*** (0.0053)	-0.0583*** (0.0217)	-0.0075*** (0.0010)	0.0040 (0.0400)
Experian business score	0.0487*** (0.0133)	0.0073 (0.0139)	-0.0664*** (0.0149)		0.0254*** (0.0065)	-0.0070*** (0.0026)
Experian personal score	0.0060 (0.0112)	0.0560*** (0.0130)	-0.0198 (0.0342)	0.0231 (0.0157)		-0.0347*** (0.0041)
Internal risk rating	-0.0142*** (0.0046)	-0.0166 (0.0108)	0.0321*** (0.0035)	-0.0032*** (0.0004)	-0.0106 (0.0123)	
Loan officer fixed effects	No	No	No	No	No	No
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,916	14,916	14,916	14,916	14,916	14,916
Adj. R ²	0.05	0.08	0.19	0.14	0.10	0.74

Panel D: Booked Loans in Groups A and B in 2004

	<u>log(Booked loan (\$))</u>	<u>Booked LTV</u>	<u>Interest rate</u>	<u>Experian business score</u>	<u>Experian personal score</u>	<u>Internal risk rating</u>
	<u>-log(Requested loan (\$))</u>	<u>-Requested LTV</u>				
	(1)	(2)	(3)	(4)	(5)	(6)
Group B (to be treated in 2005)	-0.0107 (0.0348)	-0.0130 (0.0663)	0.0012 (0.0161)	0.0009 (0.0051)	-0.0022 (0.0096)	0.0034 (0.0089)
log(Requested amount)		0.0252*** (0.0075)	0.0352*** (0.0102)	-0.0100 (0.0077)	-0.0050 (0.0099)	0.0035 (0.0155)
Personal collateral	0.0294 (0.0574)	0.0028 (0.0155)	-0.0230 (0.0216)	0.0256 (0.0194)	0.0157 (0.0185)	-0.0060 (0.0382)
LTV	-0.0137*** (0.0005)		0.0163*** (0.0054)	0.0289 (0.0351)	0.0005*** (0.0002)	0.0018 (0.0075)
LTV ²	-0.0351*** (0.0003)		0.0376*** (0.0051)	-0.0570*** (0.0182)	-0.0072*** (0.0008)	0.0038 (0.0321)
Experian business score	0.0410*** (0.0126)	0.0068 (0.0114)	-0.0570*** (0.0119)		0.0205*** (0.0064)	-0.0060*** (0.0022)
Experian personal score	0.0057 (0.0091)	0.0520*** (0.0114)	-0.0180 (0.0297)	0.0203 (0.0126)		-0.0330*** (0.0036)
Internal risk rating	-0.0116*** (0.0043)	-0.0140 (0.0087)	0.0313*** (0.0034)	-0.0030*** (0.0003)	-0.0085 (0.0108)	
Loan officer fixed effects	No	No	No	No	No	No
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,740	4,740	4,740	4,740	4,740	4,740
Adj. R ²	0.08	0.12	0.21	0.11	0.14	0.69

Table 3. Analysis of the Effects of Compensation of Booked Volume

The table presents an analysis of the effects of commission-based compensation on booked volume. Panel A uses data aggregates at the loan officer-month level to test whether volume of booked loans is higher for loan officers who receive commission-based compensation. Panel B uses application-level data to test whether loans are more likely to be accepted by loan officers who receive commission-based compensation. All regressions are OLS regressions. Variables are defined in Appendix A. In Panel A standard errors are clustered at the month level. In Panels B to D standard errors are clustered at the loan officer level. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Volume of Booked Loans

	Booked loans (monthly)			
	log(Volume (\$))		log(# booked loans)	
	(1)	(2)	(3)	(4)
Commission-based compensation	0.0933*** (0.0274)	0.0836*** (0.0288)	0.1250*** (0.0361)	0.1177*** (0.0345)
Loan officer fixed effects	Yes	Yes	Yes	Yes
Month fixed effects	No	Yes	No	Yes
Observations	30,268	30,268	30,268	30,268
Adj. R ²	0.15	0.16	0.16	0.18

Panel B: Characteristics of Booked Loans

	Loan booked (0/1)		
	(1)	(2)	(3)
Commission-based compensation	0.0707*** (0.0226)	0.0695*** (0.0218)	0.0674*** (0.0230)
log(Requested amount)		-0.0482*** (0.0174)	-0.0478*** (0.0177)
Personal collateral		0.0492*** (0.0102)	0.0489*** (0.0108)
LTV (requested)		-0.0394*** (0.0104)	-0.0383*** (0.0110)
LTV ² (requested)		-0.1303*** (0.0415)	-0.1314*** (0.0428)
Experian business score			0.0729*** (0.0284)
Experian personal score			0.0667*** (0.0144)
Internal risk rating			-0.0384** (0.0177)
Loan officer fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes
Observations	30,268	30,268	30,268
Adj. R ²	0.14	0.19	0.25

Table 4. Analysis of the Effects of Compensation on the Characteristics of Booked Loans

The table presents an analysis of the effects of commission-based on the characteristics of booked loans. The table uses a sample at the booked loan level. All regressions are OLS regressions. Variables are defined in Appendix A. Standard errors are clustered at the loan officer level. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	$\frac{\log(\text{Booked amount } \$)}{-\log(\text{Requested amount } \$)}$	Booked LTV -Requested LTV	Interest rate	Experian business score	Experian personal score	Internal risk rating
	(1)	(2)	(3)	(4)	(5)	(6)
Group B (to be treated in 2005)	-0.0107 (0.0348)	-0.0130 (0.0663)	0.0012 (0.0161)	0.0009 (0.0051)	-0.0022 (0.0096)	0.0034 (0.0089)
$\log(\text{Requested amount})$		0.0252*** (0.0075)	0.0352*** (0.0102)	-0.0100 (0.0077)	-0.0050 (0.0099)	0.0035 (0.0155)
Personal collateral	0.0294 (0.0574)	0.0028 (0.0155)	-0.0230 (0.0216)	0.0256 (0.0194)	0.0157 (0.0185)	-0.0060 (0.0382)
LTV	-0.0137*** (0.0005)		0.0163*** (0.0054)	0.0289 (0.0351)	0.0005*** (0.0002)	0.0018 (0.0075)
LTV^2	-0.0351*** (0.0003)		0.0376*** (0.0051)	-0.0570*** (0.0182)	-0.0072*** (0.0008)	0.0038 (0.0321)
Experian business score	0.0410*** (0.0126)	0.0068 (0.0114)	-0.0570*** (0.0119)		0.0205*** (0.0064)	-0.0060*** (0.0022)
Experian personal score	0.0057 (0.0091)	0.0520*** (0.0114)	-0.0180 (0.0297)	0.0203 (0.0126)		-0.0330*** (0.0036)
Internal risk rating	-0.0116*** (0.0043)	-0.0140 (0.0087)	0.0313*** (0.0034)	-0.0030*** (0.0003)	-0.0085 (0.0108)	
Loan officer fixed effects	No	No	No	No	No	No
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,740	4,740	4,740	4,740	4,740	4,740
Adj. R^2	0.08	0.12	0.21	0.11	0.14	0.69

Table 5. Analysis of the Likelihood of Default

The table presents an analysis of the effect of commission-based on the likelihood of loan default within 12 months. The table uses a sample at the booked loan level. All regressions are OLS regressions. Variables are defined in Appendix A. Standard errors are clustered at the loan officer level. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Defaulted within 12 months (0/1)			
	(1)	(2)	(3)	(4)
Commission-based compensation	0.0122*** (0.0033)	0.0120*** (0.0034)	0.0118*** (0.0036)	0.0114*** (0.0031)
Interest rate			0.0391*** (0.0137)	0.0348*** (0.0140)
Loan officer fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes
Month fixed effects	No	Yes	No	Yes
Observations	11,164	11,164	11,164	11,164
Adj. R ²	0.21	0.21	0.23	0.23

Table 6. Loan Officer Compensation and Information Asymmetry

The table presents evidence that the higher likelihood of booking loans and excessive default are driven by information asymmetry that loan officers possess. The table uses a sample at the booked loan level. Panel A explores the drivers of loan booking. Panel B explores the drivers of loan default. All regressions are OLS regressions. Variables are defined in Appendix A. Standard errors are clustered at the loan officer level. Standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Booking and Information Asymmetry

	Loan booked (0/1)		
	(1)	(2)	(3)
Commission-based compensation	0.0707*** (0.0226)	0.0674*** (0.0230)	0.0633*** (0.0216)
log(Requested amount)		-0.0478*** (0.0177)	-0.0460*** (0.0165)
Personal collateral		0.0489*** (0.0108)	0.0484*** (0.0100)
Experian business score		0.0729*** (0.0284)	0.0726*** (0.0265)
Experian personal score		0.0667*** (0.0144)	0.0626*** (0.0137)
Internal risk rating		-0.0384** (0.0177)	-0.0350** (0.0174)
LTV		-0.0383*** (0.0110)	-0.0240*** (0.0102)
LTV ²		-0.1314*** (0.0428)	-0.0870** (0.0395)
Residual from internal rating regression			-0.0485*** (0.0153)
Loan officer fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes
Observations	30,268	30,268	30,268
Adj. R ²	0.14	0.25	0.29

Table 6. Loan Officer Compensation and Information Asymmetry (Cont.)

Panel B: Default and Information Asymmetry

	Defaulted within 12 months (0/1)					
	(1)	(2)	(3)	(4)	(5)	(6)
Commission-based compensation	0.0120*** (0.0034)	0.0118*** (0.0033)	0.0115*** (0.0034)	0.0084*** (0.0034)	0.0062* (0.0035)	0.0059 (0.0036)
log(Requested amount)		0.0385*** (0.0105)	0.0375*** (0.0103)	0.0275*** (0.0100)	0.0285*** (0.0113)	0.0248*** (0.0105)
Personal collateral		-0.1206*** (0.0498)	-0.1180*** (0.0484)	-0.0834* (0.0470)	-0.0749 (0.0521)	-0.0694 (0.0526)
Experian business score		-0.0032*** (0.0012)	-0.0030*** (0.0010)	-0.0015 (0.0010)	-0.0014 (0.0012)	-0.0014 (0.0010)
Experian personal score		-0.0023*** (0.0009)	-0.0010 (0.0007)	-0.0010 (0.0007)	-0.0010 (0.0008)	-0.0010 (0.0008)
Internal risk rating		0.0406*** (0.0172)	0.0398*** (0.0169)	0.0291* (0.0165)	0.0236 (0.0173)	0.0268 (0.0193)
LTV			0.0170*** (0.0070)	0.0166*** (0.0069)	0.0187*** (0.0071)	0.0197*** (0.0079)
LTV ²			0.0707*** (0.0022)	0.0486*** (0.0022)	0.0457*** (0.0021)	0.0425*** (0.0024)
Interest rate			0.0820*** (0.0214)	0.0603*** (0.0212)	0.0624*** (0.0215)	0.0617*** (0.0205)
Residual from loan booking regression				0.0739*** (0.0187)		0.0538*** (0.0165)
Residual from internal rating regression					-0.0742*** (0.0236)	-0.0550*** (0.0208)
Loan officer fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,164	11,164	11,164	11,164	11,164	11,164
Adj. R ²	0.21	0.22	0.23	0.27	0.28	0.31

Figure 1. Acceptance Rate over Time and across Groups

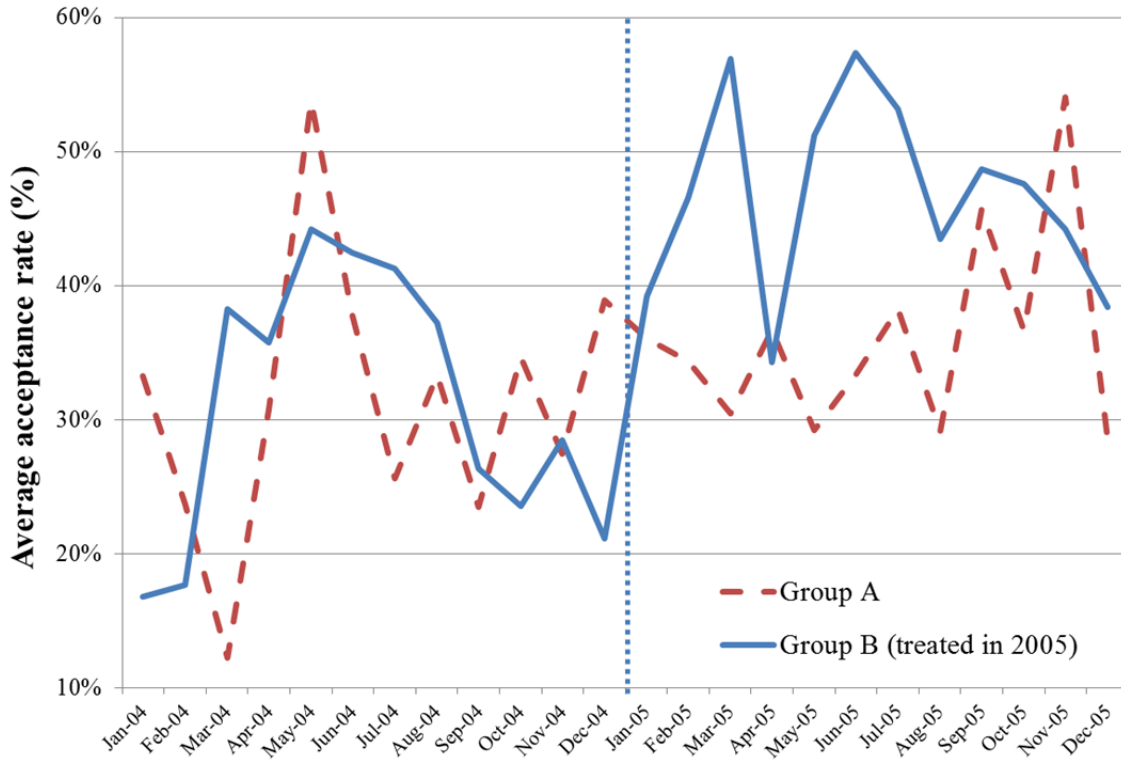


Figure 2. Average Booked Loan Amount over Time and across Groups

