Mortgage Brokers and the Effectiveness of Regulatory Oversights

Sumit Agarwal[1] Swee Hoon Ang[2] Yongheng Deng[3] Yonglin Wang[4]

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[1] Low Tuck Kwong Distinguished Professor, NUS Business School, National University of Singapore, BIZ1 7-66, 15 Kent Ridge Drive, Singapore 119245, Email: ushakri@yahoo.com, Tel: +65 6516-8119.

[2] Associate Professor, NUS Business School, National University of Singapore, BIZ1 8-17, 15 Kent Ridge Drive, Singapore 119245, Email: bizangsh@nus.edu.sg, Tel: +65 6516-3173.

[3] John P. Morgridge Distinguished Chair Professor in Business, Wisconsin School of Business, University of Wisconsin-Madison, 4110 Grainger Hall, 975 University Ave, Madison, WI 53706, USA, Email: yongheng.deng@wisc.edu, Tel: +1 (608) 262-4865.

[4] Research Assistant Professor, Pan Sutong Shanghai-Hong Kong Economic Policy Research Institute, Lingnan University, Tuen Mun, Hong Kong, Email: yonglin.lw@gmail.com , Tel:+852 2616-8596.

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Abstract

This paper studies the responses among different types of mortgage brokers to occupational licensing regulations. By explicitly accounting for heterogeneities between sole and corporate brokers, we find evidence that sole brokers respond to financial regulatory oversight by applying a more stringent screening process in loan originations based on soft information, hence achieving better loan performances. By contrast, we find no such regulatory effect on corporate brokers who tend to rely on hard information at the expense of soft information despite the latter indicating potential risks. The agency problem among sole brokers can be mitigated by the consolidated financial requirement for occupational licensing. However, such provision is ineffective in governing corporate brokers. Additionally, welfare gains associated with the occupational licensing regulation are achieved at the expense of prospective borrowers paying a higher loan price and having reduced credit access. Stricter licensing regulations may induce welfare loss related to credit rationing as reasonable loan applications are not funded, including those with potentially lower default risk.

Keywords: mortgage brokers, occupational licensing regulations, soft information, loan performance.

1. Introduction

The securitization boom in the United States subprime mortgage market during the mid-2000s was accompanied by steady prosperity in the mortgage broker business. Approximately 60% of residential mortgages were originated through mortgage brokers during 2004-2006 (Kleiner and Todd 2009, LaCour-Little 2009, Ambrose and Conklin 2014).[1] With the subsequent collapse of the real estate market bubble together with the following recession, attention especially criticisms was directed towards the role of mortgage brokers in precipitating the financial crisis. Mortgage brokers are typically blamed for being loosely and inconsistently regulated (LaCour-Little 2009). Calls have been made advocating for consolidated regulations in the mortgage broker market (Barr 2007, Brooks and Simon 2007). In this paper, we explicitly investigate the heterogeneities among different types of brokers in their responses to consolidated occupational licensing regulations.

Similar to the economics of real estate agents, a mortgage broker facilitates loan origination by reducing search time and financial costs to both lenders and borrowers (Yang and Yavas 1995, Elder et al. 2000). By consulting a mortgage broker, a prospective borrower is able to obtain more information on prices and detailed contractual terms, and has more choices provided by multiple lenders than he otherwise might have on his own. Lenders also benefit from lower financial and labor costs through economies of scale and specialization than if the loans originated through retail channels.

Despite fulfilling this important facilitating role, mortgage brokers are prone to trading off the potential benefits of choosing the most suitable loan product for the borrower against originating a loan product that generates the highest upfront profits (Berndt et al. 2010). Both public press (Barr 2007, Brooks and Simon

[1] Kleiner and Todd (2009) document that mortgage broker firms are involved in loan origination of as many as 68% of all mortgages in 2004. This figure declined to 58% by 2006. LaCour-Little (2009) documents that mortgage brokers produced around 65% of the residential loans in the United States in 2004, and the percentage increasing in 2005 and 2006 before dropping to 57% in 2007. He performs a calculation based on the statistics released from Federal Reserve Bulletin and estimates broker revenue to be nearly $29 billion in 2006. Ambrose and Conklin (2014) note that mortgage brokers, accounting for around 50% of residential mortgage originations, generated residential mortgage with estimated revenue of $20 billion in 2006 alone.

2007, Gramlich 2007) and academic research (LaCour-Little and Chun 1999, Keys et al. 2009, LaCour-Little 2009, Berndt et al. 2010, Jiang et al. 2014a) have criticized mortgage brokers for their self-centered misbehavior of encouraging excessively expensive and risky loans to maximize their own profit. While lenders can indirectly affect broker behavior through say, their funding decision, a more direct and effective way to oversee market discipline and govern brokers is to enhance the occupational licensing standards for mortgage brokers.

Among the series of licensing regulations, there is one that requires brokers to maintain a certain amount of net worth to demonstrate their ability to fulfill their financial obligations, or obtain surety bonds to show their financial credibility and willingness to perform as set forth in the bond. This financial requirement raises the stake of wrongdoing in that the money deposited as a bond will be forfeited to compensate claimants when there is broker misbehavior (Pahl 2007).

This financial requirement potentially has differential impact given that there are two types of mortgage brokers in the United States – sole proprietorships (hereinafter referred to as "sole brokers") and entities such as partnerships, corporations, or limited liability corporations (hereinafter referred to as "corporate brokers"). Although a candidate seeking for a license as a sole broker or a corporate broker is subject to the same dollar amount of bonding and net worth requirements, the one seeking to be a sole broker will have to bear this financial requirement on his own since he will be the only owner of the broker business. A corporate broker, on the other hand, generally has multiple owners to jointly share this financial burden and runs on a relatively larger scale. Hence, the impact of a regulatory financial requirement may differ between these two types of brokers.

In this paper, we develop a novel identification strategy that accounts for heterogeneities between sole and corporate brokers, and explicitly investigate their respective responses to licensing regulations. We argue that a sole broker, compared to a corporate broker with multiple owners and a relatively larger operating scale, is more likely to be impeded by this financial entry barrier and hence, is more sensitive to changes in

this financial provision. Specifically, the enhanced financial requirement is more effective in screening candidates seeking sole broker licensing and improves the quality of brokerage service as reflected in a more stringent screening process in loan origination.

We use a loan-level dataset provided by national mortgage lender, New Century Financial Corporation (NCFC).[2] In supporting our hypothesis, the empirical evidence demonstrates that sole brokers react to the elevated financial requirement by applying more stringent underwriting standards in conducting loan origination activities, resulting in higher loan prices, tightened credit supply, and reduced *ex-post* defaults. Corporate brokers, on the other hand, do not appear to respond to the financial provision to the same extent. Additionally, by exploring the underlying mechanisms under which brokers adjust their screening criteria, we find that sole brokers improve loan quality by using borrower soft information, while corporate brokers simply refer to borrower hard information even when soft information indicates potential risks.

To the best of our knowledge, this is the first study exploring the heterogeneous responses to the reinforced licensing impediments among different types of mortgage brokers. In doing so, it extends the literature in assessing the effectiveness of occupational regulations in supervising mortgage broker behavior by demonstrating that the financial requirement is exclusively effective for sole brokers but not corporate brokers. Moreover, it sheds new light on recent discussion concerning deteriorated underwriting standards by lenders induced by securitization expansion (Keys et al. 2010, Keys et al. 2012, Jiang et al. 2014b, and Rajan et al. 2015). This paper also provides novel evidence that corporate mortgage brokers tend to exacerbate their reliance on hard information in making loan decisions, thereby enlarging the disparity in underwriting criteria. In this regard, this study derives policy implications that call for attention to the heterogeneities between sole and corporate brokers who are subject to different exposure to a financial barrier. Additional regulatory oversights are advocated for the corporate broker-dominated market. Further, from the perspective of welfare analysis, while stricter licensing regulations encourage brokers to apply

[2] Studies including Berndt et al. (2010) and Ambrose et al. (2016) provide a detailed description of how a mortgage broker originates a loan funded by lenders such as New Century Financial Corporation.

more stringent screening criteria resulting in reduced default risk, it is possible that such welfare gains for the mortgage industry are achieved at the expense of loan borrowers paying a higher loan price and having reduced credit access. This paper seeks to demonstrate that there is welfare loss related to credit rationing as reasonable loan applications are not funded, including those with potentially lower default risk.

The rest of this paper is organized as follows. Section 2 reviews the literature. Section 3 describes the data and empirical design. Section 4 reports the baseline results. Section 5 presents the robustness test results. Section 6 provides supplemental tests on welfare loss, and Section 7 concludes.

2. Literature Review

2.1. Agency Problem

Arising from conflicting interests, mortgage brokers tend to focus on extracting profits by originating more loans than be responsible for subsequent performances of the loans they wrote (Alexander et al. 2002). This problem where the volume of loan originations overweighs the quality is driven in large part by characteristics of the fee-based compensation structure. Brokers are compensated by both lenders and borrowers. This may encourage them to originate loans to borrowers who may not have been qualified, or 'steer' borrowers to select products that maximize broker's own profit and not serve borrowers' best interest. Additionally, given that mortgage brokers earn origination fees every time a loan is refinanced, they are incentivized to solicit their former customers to refinance their current loans. Together, these have led brokers to maximize the volume of loan originations instead of the quality of loans they originated (LaCour-Little and Chun 1999, Keys et al. 2009, LaCour-Little 2009, Jiang et al. 2014a).

Consequently, loans originated through mortgage brokers tend to exhibit less satisfactory ex-*post* performances. Alexander et al. (2002) find evidence that loans originated through brokers exhibit higher default incidents than otherwise similar retail loans. Garmaise (2010) notes that because their earlier good performances will weigh in their favor during subsequent evaluations by banks, brokers are incentivized to

originate loans with decreasing quality as their interactions with the banks become more frequent. Evidence is also furnished by Berndt et al. (2017) who demonstrate that when lenders have fewer incentives to screen borrowers, there is a strong association between conditional fees and delinquency risk. These borrowers pay higher fees and are inherently riskier. Conklin (2017) shows that mortgage brokers have the ability to improve economic outcomes. When there is face-to-face interaction between a mortgage broker and a prospective borrower, there is reduced *ex-post* default risk, especially for borrowers with low levels of financial literacy.

2.2. Occupational Licensing Oversights

Analogous to Barker (2008) who shows that state bonding requirement is associated with improved service quality by real estate agents, Keys et al. (2009) note that stringent broker laws serve to align the perverse incentives stemming from compensation structure. Berndt et al. (2010) demonstrate that while brokers earn smaller profits in states with stricter regulations, they are able to make higher profits in states with higher financial requirement due to elevated entry barrier. However, neither of these studies formally test regulatory effect on mortgage brokers.

This study extends the literature on several dimensions: First, we explicitly account for fundamental heterogeneities between sole and corporate brokers, and examine their individual responses to licensing regulations. Second, we do not restrict the analysis to simply identifying the presence of regulatory effects on broker behavior. Rather, we go a step further by exploring the underlying channels through which brokers promote their screening standards in response to stringent regulations. Third, compared to Kleiner and Todd (2009) who use state- and broker-level data and observe a positive relationship between bonding and net worth requirements and broker earnings to arrive at the counter-intuitive conclusion that a higher financial requirement is associated with increased home foreclosures, we employ loan-level data with a rich set of loan and borrower characteristics to minimize bias potentially induced by omitted variables.

3. Data and Empirical Design

3.1. Occupational Licenses

In the United States, the occupational licensing regulations for mortgage brokers are laid down at the state level and are subject to annual adjustments. Existing license holders are usually required to renew their license on an annual basis. In other words, existing license holders, like new applicants, are subject to the latest licensing regulations which are updated every year. In this regard, one can observe variations in broker licensing regulations across states over time, allowing for a formal test on whether sole and corporate brokers respond differently to stricter occupational licensing provisions by improving their underwriting standards and eventually, better loan outcomes.

To measure the restrictions of legal entry barriers for mortgage brokers, we use Pahl's (2007) Index from 1996 to 2006 that measures each of the 24 occupational licensing components to derive the relative restrictiveness of each state's broker regulation. For corporate brokers, we follow the method used in Kleiner and Todd (2009) to create *a Regulation Index_C* by subtracting the numerical codes assigned to surety bond and net worth requirements from Pahl's Index. However, *Regulation Index_C* may not be an appropriate measure of regulation intensity for sole brokers as it contains components with less direct impact on sole brokers. For example, requirements related to opening a branch have little impact on sole broker applicants as they are less likely to launch a branch given their smaller operating scale. Thus, a separate *Regulation Index_S* for sole brokers is constructed, which refers to the summation of the numerical codes for nine components that directly affect the sole broker and the managing principal (if any). Both *Regulation Index_C* and *Regulation Index_S* measure the overall intensity of licensing provisions exclusive of the bonding and net worth requirements.

Table 1 summarizes the average dollar-amount of *bond_net worth,* the summation of the dollar amount of surety bonds and net worth requirements, by state over the period of 1996-2006. There are several features noteworthy. First, there are 10 states with no financial credibility requirement in 2006 compared to 19 states

in 1996. Second, more than half of the states experience at least one change in the *bond_net worth*, suggesting the presence of within-state variations over time. Third, in changing the *bond_net worth*, the authority makes monotonically upward adjustments and seldom lowers the standard.[3] As Pahl 2007) documented, the bonding and net worth requirements increase at both the extensive and intensive margins over time. Fourth, the high *Regulation Index_C* in California, Florida, and Oklahoma suggests that despite no financial requirement, there are stringent broad controls in governing broker license on other dimensions in these states. Last, most states have regulation oversights on either financial credibility requirement or other licensing components except for Alaska, Colorado, and Minnesota, where provisions regulating mortgage brokers are practically absent.

As shown in Table 2 Panels B and C, sole brokers are subject to a narrower coverage of licensing provisions with the average *Regulation Index_S* at 3.3 compared to 7.4 for corporate brokers (*Regulation Index_C*).[4] The average dollar amount of *bond_net worth* is $8,541, and the large standard deviation is consistent with existing substantial differences in this financial requirement across states over time. The average value of *bond_net worth* is more than doubled among corporate brokers, which is suggestive that sole brokers are more active in states with lax regulations. This observation is consistent with Figure 1 that shows continuous growth in financial credibility requirement is accompanied by a decreasing fraction of sole brokers. Note that we lag all the licensing regulation variables one year to capture their effects on brokers at the time when the loan processing started.

To address the possibility that using individual licensing components separately instead of a summated composite index may yield different results, we create a set of variables that measure the effects of individual licensing components. Similar to the regulation indices, we create indices for each of the individual licensing components for sole brokers (*var_S* in Table 2 Panel B) and corporate brokers (*var_C*

[3] The only exception was Indiana that temporarily lowered the requirement from $20,000 to $10,000 in 2003, and immediately raised it to 25,000 in 2004.

[4] Table 1 presents the state average *Regulation Index_C* for corporate brokers.

in Table 2 Panel C). Because of the differences between sole and corporate brokers, *var_S* applies mainly to the licensee, while *var_C* has a wider coverage, including the licensee, managing principals, and employees. *Additional License_S* indicates whether the managing principal is required to obtain a separate license. Similarly, *Exam_S, Education_S*, *Continue Education_S*, and *Experience_S* indicate whether pre-licensing examination, pre-licensing education, pre-licensing experience, and post-licensing continuing education are required for the licensee, respectively. *Exam_C, Education_C*, *Continue Education_C*, and *Experience_C* have similar definitions but extend the coverage to the managing principals and employees. Considering that work experience can be substituted with pre-license education or pre-license exam in some states, we include *Experience or Education_C* (defined as the maximum of *Experience_C and Education_C*) and *Experience or Exam_C* (defined as the maximum of *Experience_C and Exam_C*) for corporate brokers to capture this effect.

3.2. Data

The main dataset is sourced from NCFC, one of the largest subprime lenders in the United States prior to the mortgage crisis. Although the NCFC dataset contains loans written by a single lender,[5] borrowers and mortgage brokers who have cooperated with NCFC come from all over the country. The dataset contains loan-level information of over 0.9 million funded loans and 1.5 million loan applications, together with subsequent monthly performances of each funded loan. The dataset also includes abundant information on loan origination channels, contractual features, property attributes, and borrower characteristics, thus reducing the risk of omitted variable bias in the analyses. More importantly, for each wholesale mortgage,[6] the identity of the broker is revealed, allowing us to identify whether the brokerage activity was conducted by a sole or a corporate broker. The starting sample includes a total of over 50,000 corporate brokers who originate nearly 90% of wholesale loans and the remaining loans by approximately 7,000 sole brokers.

[5] Studies using loan-level data from a single mortgage lender include LaCour-Little (2009), Jiang et al. (2014a), Ambrose et al. (2016), and Conklin (2017).

[6] Wholesale loans account for over 80% of the mortgages funded by NCFC.

To synchronize the sample period with brokers' license regulations, we restrict the sample to funded 30-year wholesale loans to single-family residences originating between 1997 and 2006. We remove loans where the pledged property is located in the same state as the broker's licensed state to rule out the possibility that a broker originates loans in multiple states. We also exclude loans written by inactive brokers (those with less than two originations),[7] and observations with obvious error input, outliers, or missing values with respect to the variables applied in this study, giving a sample of 449,084 loans involving 33,294 mortgage brokers.

There are three subsamples based on broker identity. The sole broker sample contains 45,172 loans originated through 4,359 sole brokers. The corporate broker sample has 403,912 loans originated through 28,935 corporate brokers. A third sample consists of loans originated through both types of brokers. This pooled sample contains 226,094 loans, of which 18% are originated through 3,927 sole brokers and the rest through 13,601 corporate brokers. Since corporate brokers have wider geographical spread than sole brokers, we control for this potential geographic bias by restricting loans in zip codes with both sole and corporate brokers.

3.3. Variables

Table 2 presents the summary statistics by sample.[8] *Sole* is an indicator that takes a value of 1 if the loan is originated through a sole broker, and 0 if it is originated through a corporate broker. A loan is defined as *Default* if it becomes delinquent for 60 days within the first 24 months following origination.[9] The average default rate remains constant at 4% in both samples.

For the sole broker sample, the average Annual Percentage Rate (*APR*) of 9% is used as a proxy for loan price which represents the annual cost of a loan. The average *loan amount* is $191,684. *FICO* is the score

[7] This addresses the potential singleton issue when imposing broker fixed effect in the subsequent regression analyses.
[8] Detailed definitions of each variable are given in the Appendix Table A1.
[9] The alternative measure of default is defined as the loan becoming delinquent for 90 days within the first 36 months following origination. All results remain unchanged if this alternative measure is used.

that summarizes the borrower's creditworthiness at loan origination. Interestingly, the sole broker sample has an average *FICO* of 626, higher than that for the corporate broker sample, thus suggesting potential higher credit quality compared to borrowers who go to corporate brokers. As an additional credit measure, *Internal Rating*[10] ranging between 1 and 20 is used where a higher rating indicates a higher loan risk. Loans by sole brokers are rated at 2.48 on average. Note that this *Internal Rating* is exclusively evaluated and observed by the lender NCFC and is not revealed to investors. Debt-to-income (*DTI*) ratio and combined loan-to-value (*CLTV*) ratio are 40% and 85%, respectively. Nearly 25% of mortgages are fixed-rate loans (*Fixed rate*), and approximately 82% of the loans come with a *prepayment penalty*. These figures remain largely stable across samples.

Additionally, 46% of loans by sole brokers are *Stated-doc* mortgages. Borrowers holding this type of mortgage have limited or no income. Although corporate brokers appear to have a lower proportion of stated-doc loans than sole brokers, we will show in the subsequent analysis that once other licensing regulations and fixed effects are controlled for, sole brokers are less likely to originate stated-doc loans in response to the elevated entry barrier for licensing.

Conklin (2017) discusses the possibility that face-to-face interaction between a mortgage broker and a prospective borrower prior to the loan funding may reduce *ex-post* default risk. We account for this and find that nearly 47% (43%) of the loans by sole (corporate) brokers involve face-to-face interview (*Face*) in loan origination. As to loan purposes, 41% of loans by sole brokers are for *Purchase*, and 57% are for *No cash-out refinance*. Both samples exhibit a similar pattern in terms of property features: an overwhelming majority (91%) of mortgages are originated for properties as a *Primary Residence,* with a trivial proportion made for *Second Home* and *Investment* properties.

Turning to borrower demographic characteristics, *Single* makes up 42% of the sole broker sample. The average borrower age is 43, and 38% of borrowers are *Minority*. On average, borrowers have eight years

[10] This variable is also used by Rajan et al. (2015).

of working experience (*Job years*), and surprisingly, only 5% have *Fixed income*. In addition, 29% of borrowers are *Self-employed.* There are four dependents on average attached to each borrower (*Number of dependents*). A borrower with a larger number of dependents indicates higher exposure to unanticipated expenditures since income may be stretched across more individuals, thus indicating higher default risk (Keys et al. 2012). The corporate broker sample and the pooled sample have similar statistics and distribution. These attributes arguably reflect the relatively lower quality of borrowers in the subprime market sector. The descriptive statistics in the samples are broadly in line with that in prior research using NCFC data (e.g., Berndt et al. 2010, Ambrose et al. 2016, Berndt et al. 2017, Conklin 2017).

3.4. Empirical Design

We hypothesize that a sole broker, as the single owner of the brokerage business, will be more sensitive to the provisions adjustments compared to a corporate brokerage company. In this regard, the bonding and net worth requirements are expected to intensively align with sole broker behavior, while having little impact on corporate broker behavior. We test whether bonding and net worth requirement contribute to the stricter underwriting process by sole brokers and result in ameliorated subsequent loan performance. We estimate the following equation:

$$Y_{i,j,s,t} = \alpha_0 + \alpha_1 Log(Bond\_Net\ \ worth_{s,t}) + L'\beta + M'\gamma + B'\delta + \mu_s + \tau_t + \omega_j + \varepsilon_{i,j,s,t}$$

Eq. 1

The dependent variable $Y_{i,j,s,t}$ represents *Default* of loan *i* originated through broker *j* in state *s* in year *t*. $Log(Bond\_Net\ \ Worth_{s,t})$ denotes the logarithm of the dollar amount of surety bond and net worth requirements in state *s* in year *t.* Although we hypothesize that the bonding and net worth requirements are the most effective provision overseeing sole broker behavior, we also include L' that contains a vector of variables controlling for additional licensing provisions. M' is a vector of loan characteristics, and B' is a vector of borrower demographic features. These three vectors include variables described in Section 3.3.

μ_s is state fixed effect that accounts for the unobserved heterogeneity in regional economic conditions. τ_t is a set of variables denoting mortgage origination year to control for loan cohort effects. ω_j is a vector of the fixed effect that controls for the time-varying unobserved heterogeneity among sole brokers. To explore how brokers improve their screening criteria, we subsequently replace the dependent variable $Y_{i,j,s,t}$ with loan price (*APR*) and credit supply (*Log(loan amount)*). By conducting placebo tests based on the corporate broker sample, we expect to observe a different pattern of the estimates on loan performances, APR and loan amount among mortgages originated through corporate brokers.

We are also interested in uncovering how dynamic responses of brokers to the financial requirement evolve over time. We conduct an event study by treating the change in the bonding and net worth requirements as the occurrence of the event, with year zero (*Year of Change*) being the time when the policy is released. The sole broker sample is further restricted to loans originated in states that experienced one adjustment in the financial requirement. We follow Agarwal et al. (2019) strategy and estimate the following lag model:

$$Y_{i,j,s,t} = \alpha_0 + \sum_{x=-1}^{4} \theta_x Change_{s,t+x} + L'\beta + M'\gamma + B'\delta + \mu_s + \tau_t + \omega_j + \varepsilon_{i,j,s,t}$$

Eq. 2

$Change_{s,t}$ is a binary variable that indicates whether the surety bond and net worth requirements in state *s* have changed in year *t*. The coefficient θ_{-1} reflects the change in the loan outcomes (default, APR, and loan amount) in the year prior to the adjustment. The coefficient θ_0 measures the immediate response to the provision adjustment, and the coefficient $\theta_1, \ldots, \theta_4$ capture changes in outcomes in each of the four years following the upward adjustment in bond and net worth requirements. This analysis enables us to track the dynamics of brokers' screening decisions and demonstrates whether brokers adjust their responses to the policy change in a smooth way.

Once the impacts of the enhanced financial credibility requirement on mortgage outcomes are identified,

we investigate the mechanisms of how brokers improve the underwriting criteria in response to the stricter financial provisions. Specifically, we explicitly test how both hard and soft information[11] concerning loan characteristics and borrower features vary with the financial requirement.

$$I_{i,j,s,t} = \alpha_0 + \alpha_1 Log(Bond\_Net\ \ worth_{s,t}) + L'\beta + \mu_s + \tau_t + \omega_j + \varepsilon_{i,j,s,t}$$

Eq. 3

$I_{i,j,s,t}$ is a vector of loan/borrower characteristics of loan *i* originated through broker *j* in state *s* in year *t*. Moreover, $I_{i,j,s,t}$ is a vector of variables controlling for borrower and loan characteristics: *FICO* score, *CLTV* ratio, *Internal rating,* whether he is *Self-employed* or is *Low-income*, and whether the loan is *Stated doc. Log*$(Bond\_Net\ \ Worth_{s,t})$ denotes the logarithm of the dollar amount of surety bond and net worth requirements in state *s* in year *t.* L' contains a vector of variables controlling for additional licensing provisions. μ_s, τ_t, and ω_j are state, year, and broker fixed effect, respectively.

4. Results

4.1. Baseline Test: Does a Higher Entry Barrier Improve Sole Brokers' Screening Standards?

We begin the analysis by examining whether licensing regulations for mortgage brokers govern their brokering behavior and thereby contribute to better loan outcomes. Table 3 reports the estimates of Eq. 1 based on loans originated through sole brokers: Column (1) shows the estimates of the model that includes the combined licensing regulations net of the financial requirement (*Regulation Index_S*), and Columns (2) and (3) are estimates based on models with separate provisional components, i.e., *Additional License_S*, *Experience_S*, *Exam_S, Education_S*, and *Continue Education_S*. Column (4) has the same model specification except for *FICO* being replaced with *Internal Rating,* the alternative measure of creditworthiness. As the primary interest, the coefficients on *Log(Bond_Net Worth)* are significantly negative across different specifications of additional regulation variables, suggesting that higher bonding

[11] Stein (2002) defines hard information as something that is easy to contract upon and transmit. Keys et al. (2012) define soft information as a measure of the borrower's future job stability.

and net worth requirements for sole brokers result in lower *ex-post* borrower default risk. Interestingly, except for the key variable *Log(Bond_Net Worth)*, none of the other provisional variables appear to exert any effect on loan performance, thus supporting the hypothesis that financial requirement is the most effective regulatory oversight to impede unqualified candidates and hence, supervise existing license holders.

Columns (5) to (6) present the results based on the pooled sample where the interaction between *Log(Bond_Net Worth)* and *Sole* has significant negative coefficients, indicating lower default risk of loans by sole brokers. Other licensing regulations have little impact on loan performance as the coefficient for *Sole*Regulation_Index_C* is insignificant. This is consistent with the reasoning that sole brokers, in response to the raised financial requirement for licensing, become more cautious and rigorous in conducting brokerage activities, resulting in better loan performance.

Most of the estimated coefficients on the control variables are intuitive and are as expected. For instance, higher *FICO* scores, higher *Internal Ratings*, and lower *CLTV* ratios are related to lower default risk. *Stated-doc* loans and *Single* borrowers exhibit higher default risk, and *Female* borrowers have better performance.

4.2. Placebo Tests: Does a Higher Entry Barrier Improve Corporate Brokers' Screening Standards?

Next, we perform placebo tests by comparing the origination terms and mortgage outcomes written by corporate brokers. As shown in Table 4, the coefficients on *Log(Bond_Net Worth)* are neither economically nor statistically significant, suggesting that corporate brokers do not respond to this provision as much as sole brokers do. By contrast, *Regulation Index_C* is related to reduced default risk. Separate components, including pre-license *Experience_C*, *Continue Education_C*, and *Experience or Exam_C* are associated with better loan performance as well. These results support the hypothesis that unlike sole brokers, corporate brokers are less impacted by the regulatory financial requirements.

One concern is that sole brokers may sometimes incorporate as a limited liability corporation. In this case, it is possible that the corporate broker sample may be contaminated as some corporate brokers may, in fact,

be run by sole owners. Since the effective tax rate of a Corporation-S Corp is more than doubled that of a sole proprietor (26.6% vs 13.3% in 2004; U.S. Small Business Administration 2012), an individual as the sole owner will be incentivized to choose sole proprietorship than to incorporate. In addition, the Legal Form of Organization of Small Business in 2009-2010 shows that the percentage of businesses run by an individual in the form of a corporation should be at most 20%,[12] thus limiting the number of such incorporated entities. Nonetheless, we create a consolidated corporate broker sample by removing loans that are possibly written by sole brokers. We conduct a propensity score match and remove loans in the corporate broker sample that are observationally similar to those in the sole broker sample. Specifically, we perform the nearest-2-neighbor matching based on the propensity scores computed from the logistic regression using all the control variables in Tables 3 and 4. This creates a matched sample of 74,902 loans which are removed from the corporate broker sample, resulting in an "uncontaminated" corporate broker sample with 329,010 observations.

The results from the consolidated corporate broker sample, shown in Table 4 Columns (5) and (6) are consistent with that in Columns (1) to (4). Unlike sole brokers, corporate brokers have little exposure to the regulatory financial requirement but are subject to additional licensing provisions. We also observe significant and intuitive coefficients on other control variables such as *DTI*, *Fixed Rate, Separated, Borrower Age,* and *Number of Dependents*. This indicates that in the sole broker sample, the bonding and net worth requirements carry more power to explain default, and thereby, mitigate the explanatory power of control variables, including the separate provisional components and some borrower characteristics.

It is noteworthy that the results for corporate brokers (Table 4) exhibit a substantially different pattern compared to the estimates for sole brokers (Table 3), confirming, again, the hypothesis that there exists considerable heterogeneous exposure to various licensing regulations between sole and corporate brokers.

[12] An individual can register a small business in the form of sole proprietorship, limited liability corporation, Corporation-C Corp, Corporation-S Corp, or Corporation-S Corp (U.S. Small Business Administration). Small employer firms account for 21.5% share, of which 44% is S-corporation; Non-employer firms account for 78.5% share, of which corporations and partnerships make up 7% each. This means that at most 21.5%×44%+78.5%×14%= 20% of firms (other than sole proprietorships) may be run by an individual.

This underscores the necessity for analyzing broker behavior separately according to their identity and internal structure of brokerage firms.

4.3. Underlying Mechanisms: How do Brokers Adjust their Screening Standards to the Enhanced Financial Requirement?

Having verified that the consolidated bonding and net worth requirements are associated with more cautious brokerage activities by sole brokers and improve *ex-post* loan performances, we now explore the channels through which brokers enhance their screening standards in response to the reinforced financial entry barrier. We formally test how a series of loan and borrower characteristics vary with the policy adjustment.

Table 5 Panel A report the estimates for sole brokers.[13] The *Log(Bond_Net Worth)* does not have an effect on hard information such as *FICO* score and *CLTV* ratio. Rather, sole brokers respond to the elevated financial provision by focusing more on borrower's soft information. The coefficient on *Internal Ratings* is significantly negative, suggesting that loan quality is improved as the financial requirement is elevated. As discussed, borrowers with *Low-income* may carry higher risk since they are more likely to be exposed to payment shocks. In addition, *Stated-doc* loans, especially those originated through the wholesale channel, may involve income falsification that is associated with higher default likelihood (Jiang et al. 2014a). Lastly, borrowers with fewer *Job Years* are more vulnerable to income shocks and therefore, carry potential higher default risk. As evidenced in Columns (4) to (6), the risk is alleviated in that the proportion of low-income borrowers, stated-doc loans, and borrowers with less work experience is reduced when the licensing financial requirement is enhanced. Panel B reports similar results using the pooled sample.

However, the estimates on loans originated through corporate brokers (Panel C) are in sharp contrast to the estimates based on sole brokers and the pooled sample. As the financial requirement is enhanced, corporate brokers are more attracted to loan applicants with higher *FICO* scores and lower *CLTV* ratios, even at the

[13] To conserve space, the estimates for control variables are suppressed and not reported. The detailed results are available on request.

expense of elevated risk evidenced in higher *Internal Ratings*. These results are consistent with the findings by Rajan et al. 2015) that lenders such as NCFC are abandoning their internal rating measure when pricing loans or making loan decisions, and relying more heavily on hard information such as *FICO* score and *LTV* ratio that is reported to investors in subsequent securitization.

Looking at soft information, the fraction of borrowers with low-income rises with no impact on *Stated doc* and *Job Years*. This again reinforces the contention that corporate brokers have more incentives to place emphasis exclusively on hard information and ignore soft information during the origination screening process. These informative results further underscore the importance of treating sole brokers and corporate brokers separately. The benefits from the increased FICO score and lower CLTV ratio are probably offset by the adverse effect reflected in higher internal ratings and riskier soft information, which explains the absence of financial regulatory effect on defaults in corporate broker-generated loans shown in Table 4.

To sum up, sole brokers and corporate brokers demonstrate dramatic differences in forming and revising their underwriting standards when confronted with the consolidated financial requirement for licensing. Sole brokers are inclined to select borrowers exhibiting higher quality in terms of soft information, whereas corporate brokers prefer borrowers with decent hard information such as high FICO score and low CLTV ratio, and are less likely to exert effort to process soft information even if such information may imply deteriorated borrower quality. This finding is consistent with the notion that hard information such as FICO score can be a poorer predictor of loan defaults (Rajan et al. 2015). Further, the results shed light on discussions regarding differential in loan screening intensity caused by easing mortgage securitization (Keys et al. 2009, 2010, Keys et al. 2012, Jiang et al. 2014b). The results suggest the possibility that corporate brokers exacerbate lenders' dependence on hard information over soft information in loan origination.

4.4. Loan Price, Credit Supply, and Response Dynamics

To explore how brokers improve their screening process in response to the consolidated licensing

regulations, we investigate broker responses in terms of price and credit supply. Table 6 Columns (1) to (4) show that for sole brokers, higher bonding and net worth requirements are associated with higher loan price and lower credit supply. This implies that sole brokers become more cautious and rigorous in conducting brokerage activities by proposing lower credit supply along with higher loan price. By contrast, as shown in Columns (7) to (10) for corporate brokers, higher financial provision does not affect credit supply but is associated with lower APR.

We are also interested in understanding the response dynamics before and after the change in financial requirement. To this end, we conduct an event study to explore the dynamic evolution of broker response. The sample is further restricted to loans originated through sole brokers from states with only one adjustment in surety bond or net worth requirements from 1997 to 2006. Table 7 presents the estimates of Eq. 2. Note that Columns (1) to (3) are estimates from the model with event year dummies included, and in Columns (4) to (6), each of the year dummies interacts with the bonding and net worth requirements (*Log(Bond_Net Worth)*) as an alternative specification. Other provisional variables, controls for loan and borrower characteristics, and fixed effects remain the same as specified in Table 3.

There is no significant change in APR, loan amount, or defaults in years prior to or undergoing the change. This reinforces the exogeneity of policy changes in broker licensing provisions. As shown in Columns (1) and (4), APR starts to increase one year after the adjustment, while the growth decelerates immediately and disappears in the following three years. Similarly, as shown in Columns (3) and (6), there is essentially no temporal variation in defaults until one year after the policy change. Interestingly, the decrease becomes vague in the second year after the event and resumes significance in the third year following the change. Moreover, Columns (2) and (5) show no temporal variation in loan amount until the third year following the occurrence of the event when there is a significant decrease in loan amount. Neither APR, loan amount, nor defaults experience any variation in the fourth year after the adjustment. It is noteworthy that even if the year controls are replaced with the interaction terms between year dummy and *Log(Bond_Net Worth),* the results are robust in terms of the significance of the coefficients and the dynamic pattern.

Figure 2 plots the average APR, loan amount, and default over a seven-year window. Remarkably, the trend in loans by sole brokers (represented by the solid line) closely corresponds to the results reported in Table 7. This reinforces the validity of the analysis of response dynamics. Moreover, the path for loans originated through corporate brokers (plotted by the dashed line) indicates the differences when compared to sole brokers. Given the policy change, there is essentially no variation in loan defaults by corporate brokers. Although APR experiences a small decrease after the change, it is higher than that by sole brokers throughout the window. Sole brokers tend to originate loans with larger size before the event, and gradually reduce the loan amount after the event. By contrast, corporate brokers maintain a steady loan amount prior to the event and begin to raise loan amount immediately after the event, and eventually reduce the quantum to the pre-event level.

5. Robustness

5.1. Loan Type and Geography

We perform a series of in-depth robustness tests to justify the stability of the baseline results. Considering the potential higher default risk in stated documentation loans, it may well be that the improved loan performances observed in earlier analyses are attributed to the inherent better quality of full documentation loans. To alleviate this concern, we further categorize the sole broker sample into two groups based on loan type and analyze the performances of stated-doc and full-doc loans separately.

As shown in Table 8 Columns (1) and (2), both stated-doc and full-doc loans exhibit reduced default risk as the bonding and net worth requirements are raised. These results appear to be inconsistent with the conclusion by Jiang et al. (2014a) that mortgage brokers worsen the agency problems among low-doc loans.[14] Considering that Jiang et al. (2014a) do not differentiate sole brokers from corporate brokers, it may be that their results are due to the misbehavior of corporate brokers, who constitute a dominant share

[14] Stated-doc in the NCFC is frequently referred to as low-doc in the industry and some literature.

in the mortgage broker industry. Again, this inconsistency underscores the importance of accounting for the heterogeneity between sole and corporate brokers when studying the role of brokers in mortgage lending.

Moreover, we are interested in identifying whether broker responses to the tightened licensing regulations are subject to regional heterogeneity. We compare the performances of loans originated in four sand states – namely, Arizona, California, Florida, and Nevada – that were hit severely by the housing bubble burst to those in the remaining 47 states (Columns (3) and (4) respectively). Further, as shown in Column (5), we exclude states that never have surety bonds or net worth requirement throughout the sample period of 1997-2006 and restrict the focus to loans originated in the states with non-zero financial provision.

Again, the estimated coefficients on *Log(Bond_Net Worth)* are largely consistent in terms of the sign and significance. We find no spatial variation in the regulatory effect on sole brokers. Even in sand states that experienced the most acute housing downturn, sole brokers governed by stricter licensing regulations consistently apply more stringent screening standards in conducting origination activities, and consequently, result in better loan performance.

5.2. Falsification Test

One concern is that the improved loan performances by sole brokers could be the result of unobserved factors rather than the elevated financial requirement for occupational licensing. We address this by conducting a falsification test (Agarwal et al. 2012). The intuition is that if this concern were correct, then one should find similar outcomes if values of bonding and net worth requirements in any state were randomly picked. We randomize the values and loans in the sole broker sample and randomly assign a value to each loan. Alternatively stated, each of the loans in the sole broker sample is randomly assigned a value representing bonding and net worth requirements. We subsequently repeat the baseline default analysis as specified in Eq. 1, and collect the statistics obtained from each regression.[15] This randomization process

[15] The estimation is conducted in the same way as those presented in Columns (1) to (4) in Table 3.

was performed 1000 times.

Figure 3 illustrates the distribution of parameter estimates and the corresponding t-values obtained from each of the randomization regressions. As shown in Figure 3(a), the magnified parameter estimates closely fit a normal distribution,[16] with the mean estimated coefficients infinitely close to zero. The coefficient estimated at -0.05 from the baseline analysis (represented by the solid line), is located far outside the 95% confidence interval. Similarly, as shown in Figure 3(b), the t-values for the parameter estimates largely follow a normal distribution, with roughly 95% of the area under the kernel density curve laid within 1.96 standard deviations of the mean. Taken together, the falsification test shows that loan defaults do not respond to randomized bonding and net worth requirements, which reinforces the baseline results.

6. Welfare Loss

The above results provide evidence that stricter occupational regulation of mortgage brokers, especially sole brokers, is associated with a lower incidence of default. However, this welfare gain may have been realized at the cost of higher APR paid by borrowers and lower credit supply. We investigate whether sole brokers over-react in response to the higher financial requirement by employing a more stringent screening standard that leads to suppressed credit access and eventually, welfare loss. Table 9 Panel A documents that loan application rejections are positively associated with the elevated financial requirement. The results are robust across samples and model specifications. In particular, the estimates for sole brokers (Columns (1), (2) and (5)) are larger than those for corporate brokers (Columns (3) and (4)). This reinforces our conclusion that sole brokers are more "skin in the game" with respect to the enhanced bonding and net worth requirements.

We further investigate whether the elevated financial requirement causes brokers to over-screen borrowers with good credit quality by analyzing the loan performance of those funded loans in the corporate broker

[16] Note that since the parameter estimates are extremely small in size, they are magnified 10000 times to facilitate graphing.

sample that are similar to the rejected loans submitted by sole brokers. In doing so, we can examine the counterfactual loan performance if these rejected loans were funded. First, we create a "treated sample," which contains 15,247 unfunded loans submitted by sole brokers.[17] Second, we have a "control sample" which contains all funded loans submitted by corporate brokers. After which, we perform the nearest-neighbor matching based on the propensity scores computed from a logistic regression using all the control variables in Tables 3 and 4, and additional borrower characteristics including citizenship, total assets, and whether the borrower is a first-time homebuyer.[18] Matching the "treated sample" in the "control sample" gives a matched sample containing 14,267 loans – loans funded through corporate brokers but observationally similar to those rejected loans submitted by sole brokers. Lastly, this matched sample is merged with the baseline corporate broker sample. The intersection furnishes 5,998 propensity-score matched loans which are marked as *Sole-Rejected* in Panel B Column (1). Given that sole brokers are less likely to serve loan-income borrowers while corporate brokers are more likely to be attracted to borrowers with decent FICO scores, we refine the "treated sample" to those unsuccessful applicants with sole brokers but with high-FICO scores, giving us 9,515 matched loans in the "control sample," and 2,773 propensity-score matched loans in the corporate broker sample, as shown in Panel B Column (2). Similarly, we refine the "treated sample" to those low-income unsuccessful applicants. Panel B Column (3) shows the 5,767 matched loans in the "control sample," and 2,350 propensity-score matched loans in the corporate broker sample.

Panel B Columns (1) and (2) show that *Sole-Rejected* loans, if funded, exhibit better loan performances, especially those with decent FICO scores. Interestingly, compared to Model (1), the estimate is doubled in Model (3), indicating that these low-income applicants are associated with even lower default risk.

To conclude, when the financial requirement of licensing regulations is elevated, mortgage brokers

[17] There are 0.3 million unfunded loan applications involving sole brokers. To improve the matching similarity, we include a wide range of borrower characteristics with non-missing observations. Therefore, the final "treated sample" size is reduced to 15,247.

[18] These additional variables are not included in our previous analyses since they are largely missing in observations and including them may cause significantly reduction in sample sizes.

especially sole brokers who are more "skin in the game," apply more stringent screening criteria, resulting in better loan performances. Corporate brokers, though not sensitive to the financial requirements, are governed by other licensing regulations such as *Regulation Index_C*, *Continue Education_C*, and *Experience_C*, and experience reduced default risk as well. Loan borrowers are paying this welfare gain with higher APR and lower loan amount. More importantly, there is welfare loss related to credit rationing as many reasonable loan applications, including those with potentially lower default risk, are not funded.

7. Conclusions

While once lauded as matchmakers who significantly improve efficiency in loan originations, mortgage brokers are now confronted with growing criticisms given their perceived misbehavior stemming from agency problem. This paper sheds light on this debate by exploring the effectiveness of occupational licensing regulations in governing the behavior of mortgage brokers. In the United States, a prospective mortgage brokerage firm can be licensed either as a sole proprietorship or an entity such as partnership, corporation or limited liability corporation. Among the various occupational licensing regulations for mortgage brokers, there is a particular provision that explicitly requires both sole and corporate brokers to maintain a certain amount of net worth to demonstrate their ability to fulfill their financial obligations, or alternatively to obtain surety bonds to show financial credibility and willingness to perform as set forth in the bond (Pahl 2007). Although compared to corporate brokers, sole brokers are subject to the same dollar amount as per bonding and net worth requirements, they are more exposed to this provision since they are the sole owner of the broker business. Corporate brokers, on the other hand, operate at a relatively larger scale and have multiple owners to jointly and severally fulfill this financial requirement. We hypothesize that sole brokers are more sensitive to the changes in this financial requirement and therefore, exhibit more stringent screening process in loan origination.

Our results consistently indicate that sole brokers react to the consolidated financial requirement by performing more cautiously and rigorously in conducting brokerage services, as evidenced in originating

lower loan amount, negotiating higher loan price, and improved subsequent loan performances. However, these findings are absent in the analysis among corporate brokers, which supports the hypothesis that sole brokers are more affected by the elevated financial requirement in occupational licensing. Additional regulatory oversights are needed for corporate brokers beyond financial requirements.

We further investigate the underlying mechanisms under which brokers enhance their screening standards in response to more stringent licensing regulations. The results imply that sole brokers place more emphasis on borrowers' soft information over hard information: they prefer borrowers with better internal ratings and are less likely to select borrowers with implicitly risky features such as less work experience or low income. Moreover, sole brokers are less likely to originate stated-doc loans as well. Corporate brokers, by contrast, simply pursue improved hard information such as decent FICO score and CLTV ratio even at the cost of elevated potential risk reflected in soft information. An array of robustness tests justifies that the financial regulatory effects on sole brokers are consistent across mortgage types and regions.

This paper contributes to the existing literature in mortgage broker on several dimensions: First, it extends previous studies by explicitly accounting for the heterogeneous responses to the consolidated occupational licensing regulations between sole and corporate brokers. The study provides evidence that sole and corporate brokers exhibit different responses to regulatory oversights. Second, this paper extends the existing literature, which is restricted to detect the regulatory effect on mortgage brokers, by exploring the mechanisms under which sole and corporate brokers react to financial regulations by adjusting their screening strategies accordingly. Our analysis on welfare loss indicates that stricter licensing regulations may encourage brokers to over-react in screening loan applicants, causing reduced credit access as some reasonable loan applications may not be funded, including those with potentially lower default risk. Third, this paper contributes to the fast-growing literature that examines the misaligned incentives for loan screening due to the expansion in mortgage securitization. Hard information such as FICO scores becomes increasingly important for lenders in making loan funding and pricing decisions but becomes a poorer predictor of loan defaults (Keys et al. 2010, Keys et al. 2012, Rajan et al. 2015). Our findings provide novel

evidence that in responding to the elevated financial requirement for occupational licensing, corporate brokers exacerbate this tendency. As the intermediary and the major player in the loan origination process, they serve to tilt the screening standards toward heavy reliance on hard information and push away from soft information.

Finally, this paper broadly contributes to the growing controversy over the role of mortgage brokers in causing the financial crisis. This paper presents evidence that even in states undergoing the most severe economic downturn, the financial requirement is effective in mitigating moral hazards among sole brokers. We provide evidence that the agency problem among sole brokers can be mitigated by the consolidated financial requirement for occupational licensing. However, such a provision is ineffective in governing corporate brokers where the agency problems may be exacerbated. From a policy perspective, this analysis provides insights into how the occupational licensing regulations for mortgage brokers should be reformed.

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Table 1 Summary of License Regulations for Mortgage Broker by State during 1996-2006

State	Number of changes	Bond_Net Worth (dollar amount)	Regulation Index	State	Number of changes	Bond_Net Worth (dollar amount)	Regulation Index
AK	0	0	0	MT	1	6,818	3.27
AL	1	11,364	1.82	NC	1	22,727	5.09
AR	2	60,455	1.82	ND	0	25,000	1
AZ	0	10,000	5	NE	1	54,545	1
CA	0	0	10	NH	0	20,000	1.55
CO	0	0	0	NJ	2	120,455	8
CT	1	51,364	4.27	NM	0	25,000	1
DC	0	22,500	1	NV	1	18,182	7
DE	0	25,000	1	NY	1	2,727	2
FL	0	0	14.45	OH	1	36,364	6.55
GA	1	34,091	3.18	OK	0	0	5.18
HI	0	15,000	5.64	OR	1	20,909	4.55
IA	1	18,182	2.18	PA	0	0	2.64
ID	2	20,455	4.55	RI	0	20,000	4.64
IL	1	59,091	5.18	SC	0	10,000	5.82
IN	1	43,182	3.73	SD	0	0	1.82
KS	2	31,818	3.09	TN	1	85,455	1.18
KY	1	45,455	3.27	TX	1	15,909	5.18
LA	2	38,636	4.27	UT	0	0	3.73
MA	0	0	3.45	VA	1	15,909	1
MD	1	14,773	3.18	VT	2	11,818	2.91
ME	1	12,727	1.27	WA	0	20,000	5
MI	0	25,000	1	WI	1	8,182	2.18
MN	0	0	0.73	WV	2	27,273	2.64
MO	1	40,455	1	WY	1	4,545	0.36
MS	0	25,000	4.27				

Data source: Pahl (2007), "A Compilation of State Mortgage Broker Laws and Regulations, 1996–2006"

This table presents 1. Number of changes in surety bond/ net worth requirement in each state during 1996-2006;

2. State-level average value of surety bond and net worth requirements during 1996-2006;

3. State-level average regulation index (Subtract the numerical codes assigned to surety bond and net worth requirements from the Pahl's Index, which measures the overall restrictiveness of various licensing regulations).

Table 2 Descriptive Statistics

Panel A. Loan Variables

Variables	Sole Brokers		Corporate Brokers			Pooled Sample	
	Mean	Std.Dev.	Mean	Std.Dev	Diff.	Mean	Std. Dev.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sole						0.18	0.38
Default	0.04	0.21	0.04	0.20	0	0.04	0.19
LICENSE REGULATION VARIABLES							
Bond_Net Worth	8541	19748	17980	29307	-9440**	8167.42	18712.61
Log(Bond_Net Worth)	2.72	4.52	4.87	5.15	-2.15**	2.74	4.51
*Sole*Log(Bond_Net Worth)*						0.42	2.02
LOAN CHARACTERISTICS							
APR	8.93	1.65	8.89	1.60	0.04**	8.79	1.62
Loan amount	191684	120902	231199	139357	-39515**	228045	131251
FICO	626	63	614	61	12**	621	62
DTI	85.06	14.68	83.88	14.22	1.18**	83.49	15.00
CLTV	40.18	8.76	39.97	8.94	0.21**	40.42	8.71
Internal rating	2.48	3.29	2.42	2.94	0.06**	2.43	3.09
Fixed rate	0.25	0.43	0.26	0.44	-0.01**	0.25	0.43
Prepayment penalty	0.82	0.38	0.78	0.41	0.04**	0.85	0.36
Stated doc	0.46	0.50	0.40	0.49	0.06**	0.43	0.50
Interviewed	0.47	0.50	0.43	0.49	0.04**	0.42	0.49
Purchase	0.41	0.49	0.33	0.47	0.08**	0.34	0.47
No cash-out refinance	0.57	0.50	0.64	0.48	-0.07**	0.64	0.48
Cash-out refinance	0.02	0.15	0.03	0.16	-0.01**	0.03	0.16
PROPERTY CHARACTERISTICS							

Primary residence	0.91	0.28	0.91	0.28	0	0.92	0.27
Second home	0.012	0.11	0.013	0.11	0.001**	0.01	0.11
Investment	0.07	0.26	0.07	0.26	0	0.07	0.25
BORROWER CHARACTERISTICS							
Fixed income	0.05	0.22	0.07	0.26	-0.02**	0.06	0.24
Married	0.57	0.49	0.60	0.49	-0.03**	0.60	0.49
Single	0.42	0.49	0.40	0.49	0.02**	0.39	0.49
Separated	0.01	0.08	0.01	0.08	0	0.01	0.08
Borrower age	42.5	11.83	43.22	11.91	-0.72**	43.18	11.89
Minority	0.38	0.49	0.31	0.46	0.07**	0.36	0.48
Female	0.38	0.49	0.37	0.48	0.01**	0.37	0.48
Job years	7.77	7.63	8.04	8.22	-0.27**	8.06	7.95
Self-employed	0.29	0.45	0.23	0.42	0.06**	0.25	0.44
Number of dependents	3.92	1.78	3.76	1.89	0.16**	3.85	1.83
Market size (1 year lagged)	0.11	0	0.07	0	-0.42***	0.11	0.06
Number of loans:	45,172		403,915			226,094	
Number of brokers	4,359		28,935			17,528	

1. *** p<0.01, ** p<0.05, * p<0.1.
2. Column (5) reports the statistical significance of the mean differences between Columns (1) and (3) based on t-test.

Table 2 Descriptive Statistics

Panel B. Regulation Variables for Sole Brokers

	Sole Brokers			
Variable	Mean	Std. Dev.	Min	Max
Regulation Index _S	3.29	1.31	0	6
Additional License _S	0.07	0.33	0	2
Experience_S	0.67	0.47	0	1
Education_S	0.84	0.43	0	2
Exam_S	0.73	0.44	0	1
Continue Education_S	0.80	0.43	0	2

Table 2 Descriptive Statistics

Panel C. Regulation Variables for Corporate Brokers

	Corporate Brokers				Pooled Sample			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Regulation index _C	7.39	4.29	0	16	8.46	3.35	0	16
Additional license _C	1.87	0.97	0	4	1.88	0.66	0	4
Experience_C	0.63	0.5	0	2	0.82	0.39	0	2
Education_C	1.20	0.88	0	2	1.53	0.75	0	2
Continue Education_C	1.22	1	0	4	1.6	0.84	0	4
Experience or Education_C	1.32	0.78	0	2	1.59	0.67	0	2
Experience or Exam_C	1.15	0.89	0	2	1.55	0.76	0	2

Table 3 Baseline Test: Does a Higher Entry Barrier Improve Sole Brokers' Screening Standards?

Dependent. Variable: *Default*

	Sole Brokers				Pooled sample	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Sole					0.0261	0.0180
					(0.2546)	(0.4315)
*Sole*Log(Bond_Net Worth)*					-0.0035**	-0.0031**
					(0.0182)	(0.0376)
Log(Bond_Net Worth)	-0.0045***	-0.0048***	-0.0047***	-0.0039***		
	(0.0012)	(0.0006)	(0.0020)	(0.0051)		
Regulation Index_S	-0.0067			-0.0036		
	(0.1490)			(0.4333)		
Additional License_S		-0.0243	-0.0243			
		(0.2065)	(0.2070)			
Experience_S		-0.0077	-0.0070			
		(0.7714)	(0.7931)			
Exam_S		-0.0088	-0.0087			
		(0.3202)	(0.3277)			
Education_S		-0.0034	-0.0030			
		(0.7340)	(0.7667)			
Continue Education_S			-0.0035			
			(0.8718)			
*Sole*Regulation_Index_C*					-0.0023	-0.0016
					(0.2089)	(0.3608)
FICO/100	-0.0393***	-0.0393***	-0.0393***		-0.0292***	
	(0.0000)	(0.0000)	(0.0000)		(0.0000)	
Internal rating				0.0021***		0.0029***
				(0.0000)		(0.0000)
CLTV/100	0.0644***	0.0644***	0.0644***	0.0328***	0.0442***	0.0288***
	(0.0000)	(0.0000)	(0.0000)	(0.0007)	(0.0000)	(0.0000)
DTI/100	0.0177	0.0178	0.0177	0.0307**	0.0104**	0.0192***
	(0.1449)	(0.1430)	(0.1434)	(0.0114)	(0.0378)	(0.0001)
Log(loan amount)	0.0069***	0.0069***	0.0069***	0.0057**	0.0071***	0.0058***
	(0.0095)	(0.0098)	(0.0098)	(0.0333)	(0.0000)	(0.0000)
APR	0.0032***	0.0033***	0.0033***	0.0101***	0.0056***	0.0098***
	(0.0032)	(0.0030)	(0.0030)	(0.0000)	(0.0000)	(0.0000)
Fixed rate	-0.0045	-0.0045	-0.0045	-0.0091***	-0.0019	-0.0053***
	(0.1481)	(0.1470)	(0.1475)	(0.0035)	(0.1383)	(0.0000)

Second home	0.0084	0.0084	0.0084	-0.0051	0.0023	-0.0069*
	(0.3892)	(0.3894)	(0.3888)	(0.5988)	(0.5756)	(0.0879)
Investment	0.0045	0.0045	0.0045	-0.0062	0.0006	-0.0063***
	(0.2768)	(0.2766)	(0.2759)	(0.1309)	(0.7533)	(0.0003)
No cash-out refinance	-0.0157***	-0.0158***	-0.0158***	-0.0069**	-0.0120***	-0.0051***
	(0.0000)	(0.0000)	(0.0000)	(0.0142)	(0.0000)	(0.0000)
Cash-out refinance	-0.0021	-0.0022	-0.0022	-0.0081	-0.0089**	-0.0123***
	(0.8104)	(0.7996)	(0.8018)	(0.3494)	(0.0113)	(0.0005)
Fixed income	0.0049	0.0049	0.0049	0.0025	-0.0011	-0.0015
	(0.3422)	(0.3390)	(0.3397)	(0.6238)	(0.5980)	(0.4466)
Prepayment penalty	0.0020	0.0020	0.0020	0.0128***	0.0021	0.0117***
	(0.5581)	(0.5486)	(0.5477)	(0.0002)	(0.1638)	(0.0000)
Single	0.0087***	0.0087***	0.0087***	0.0085***	0.0113***	0.0113***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0000)	(0.0000)
Separated	-0.0018	-0.0018	-0.0018	-0.0013	0.0051	0.0059
	(0.8887)	(0.8887)	(0.8887)	(0.9180)	(0.3306)	(0.2644)
Borrower age	-0.0001	-0.0001	-0.0001	-0.0001	-0.0000	-0.0001
	(0.4295)	(0.4225)	(0.4235)	(0.1727)	(0.3535)	(0.1421)
Minority	-0.0001	-0.0002	-0.0001	0.0012	0.0039***	0.0051***
	(0.9660)	(0.9536)	(0.9546)	(0.6482)	(0.0001)	(0.0000)
Female	-0.0047**	-0.0047**	-0.0047**	-0.0040*	-0.0034***	-0.0029***
	(0.0266)	(0.0266)	(0.0266)	(0.0599)	(0.0001)	(0.0010)
Interviewed	-0.0024	-0.0024	-0.0024	-0.0025	-0.0019*	-0.0024**
	(0.3504)	(0.3516)	(0.3511)	(0.3404)	(0.0829)	(0.0300)
Stated doc	0.0136***	0.0136***	0.0136***	0.0045*	0.0081***	0.0025**
	(0.0000)	(0.0000)	(0.0000)	(0.0682)	(0.0000)	(0.0153)
Job years	-0.0002*	-0.0002*	-0.0002*	-0.0003**	-0.0003***	-0.0003***
	(0.0905)	(0.0985)	(0.0976)	(0.0189)	(0.0000)	(0.0000)
Self-employed	-0.0013	-0.0013	-0.0013	-0.0016	0.0012	0.0008
	(0.6101)	(0.6124)	(0.6121)	(0.5515)	(0.2744)	(0.4572)
Number of dependents	0.0007	0.0007	0.0007	0.0004	-0.0003	-0.0004
	(0.2652)	(0.2680)	(0.2676)	(0.5641)	(0.3140)	(0.1046)
Market size (%)	-0.0071***	-0.007***	-0.007***	-0.0035	-0.0032***	-0.001
	(0.0028)	(0.0034)	(0.0033)	(0.1433)	(0.0008)	(0.3215)
Constant	0.0387	0.0343	0.0341	-0.2500	0.1531	0.1468
	(0.8556)	(0.8719)	(0.8727)	(0.2405)	(0.4842)	(0.5025)
Year FE		Yes			Yes	
State FE		Yes			Yes	
Broker FE		Yes			Yes	
Observations	45,172	45,172	45,172	45,172	226,094	226,094
R-squared	0.1506	0.1506	0.1506	0.1438	0.1313	0.1312

1. *** p<0.01, ** p<0.05, * p<0.1.
2. P-values in parentheses.
3. This table reports the estimates of Eq. 1 with the dependent variable being *Default*. Columns (1) to (4) show the results using the sole broker sample, i.e., loans originated through sole brokers; Columns (5) and (6) show the results using the pooled sample containing loans written by both types of brokers.
4. We lag all the licensing regulation variables and market size one year to capture their effects on brokers at the time when the loan processing started.

Table 4 Placebo Tests: Does a Higher Entry Barrier Improve Corporate Brokers' Screening Standards?

Dependent. Variable: *Default*

	Corporate Brokers				Consolidated Corporate Broker Sample	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Log(Bond_Net Worth)	0.0000	0.0001	-0.0002	-0.0002	-0.0000	0.0000
	(0.9693)	(0.7970)	(0.6859)	(0.6443)	(0.9661)	(0.9832)
Regulation Index_C	-0.0041***			-0.0032***	-0.0044***	
	(0.0000)			(0.0000)	(0.0000)	
Additional License _C		-0.0036	-0.0044			-0.0057*
		(0.2099)	(0.2259)			(0.0627)
Experience_C		-0.0104**				-0.0063
		(0.0352)				(0.2321)
Education_C		-0.0024				-0.0038
		(0.5129)				(0.3501)
Continue Education_C		-0.0118***				-0.0123***
		(0.0000)				(0.0000)
Experience or Education_C			-0.0054			
			(0.1409)			
Experience or Exam_C			-0.0076**			
			(0.0157)			
FICO/100	-0.0308***	-0.0309***	-0.0307***		-0.0315***	-0.0315***
	(0.0000)	(0.0000)	(0.0000)		(0.0000)	(0.0000)
Internal rating				0.0035***		
				(0.0000)		
CLTV/100	0.0390***	0.0388***	0.0390***	0.0234***	0.0385***	0.0383***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
DTI/100	0.0125***	0.0125***	0.0125***	0.0212***	0.0126***	0.0126***
	(0.0012)	(0.0012)	(0.0012)	(0.0000)	(0.0035)	(0.0035)
Log(loan amount)	0.0055***	0.0055***	0.0055***	0.0043***	0.0037***	0.0037***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0001)	(0.0001)
APR	0.0062***	0.0062***	0.0063***	0.0097***	0.0065***	0.0064***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fixed rate	-0.0064***	-0.0064***	-0.0063***	-0.0104***	-0.0069***	-0.0069***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Second home	-0.0018	-0.0016	-0.0019	-0.0119***	-0.0005	-0.0003

	(0.5641)	(0.5956)	(0.5356)	(0.0001)	(0.8959)	(0.9278)
Investment	0.0016	0.0017	0.0016	-0.0066***	0.0020	0.0020
	(0.2282)	(0.2205)	(0.2475)	(0.0000)	(0.1842)	(0.1775)
No cash-out refinance	-0.0107***	-0.0106***	-0.0107***	-0.0050***	-0.0108***	-0.0108***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Cash-out refinance	-0.0170***	-0.0168***	-0.0173***	-0.0194***	-0.0204***	-0.0201***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Fixed income	0.0006	0.0006	0.0005	0.0005	0.0008	0.0008
	(0.7051)	(0.7090)	(0.7200)	(0.7527)	(0.6345)	(0.6320)
Prepayment penalty	0.0052***	0.0051***	0.0053***	0.0116***	0.0048***	0.0047***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0002)	(0.0003)
Single	0.0110***	0.0110***	0.0110***	0.0110***	0.0108***	0.0108***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Separated	0.0093**	0.0093**	0.0093**	0.0101**	0.0078*	0.0078*
	(0.0242)	(0.0239)	(0.0243)	(0.0145)	(0.0958)	(0.0945)
Borrower age	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Minority	0.0060***	0.0061***	0.0060***	0.0078***	0.0056***	0.0057***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Female	-0.0044***	-0.0044***	-0.0044***	-0.0040***	-0.0048***	-0.0048***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Interviewed	-0.0011	-0.0011	-0.0011	-0.0017*	-0.0016	-0.0016
	(0.1994)	(0.1975)	(0.2043)	(0.0509)	(0.1055)	(0.1049)
Stated doc	0.0100***	0.0100***	0.0099***	0.0044***	0.0101***	0.0102***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Job years	-0.0002***	-0.0002***	-0.0002***	-0.0003***	-0.0002***	-0.0002***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Self-employed	0.0014	0.0014	0.0015	0.0011	0.0010	0.0009
	(0.1159)	(0.1200)	(0.1102)	(0.2422)	(0.3619)	(0.3716)
Number of dependents	-0.0004**	-0.0004**	-0.0004**	-0.0005***	-0.0003	-0.0003
	(0.0325)	(0.0310)	(0.0314)	(0.0047)	(0.2115)	(0.2107)
Market size (%)	-0.0027***	-0.0031***	-0.0024***	-0.0019**	-0.0026***	-0.0029***
	(0.0008)	(0.0002)	(0.0033)	(0.0195)	(0.0062)	(0.0019)
Constant	0.2004***	0.2006***	0.2006***	-0.0351	0.2318***	0.2315***
	(0.0049)	(0.0049)	(0.0049)	(0.6221)	(0.0024)	(0.0024)
Year FE		Yes			Yes	
State FE		Yes			Yes	
Broker FE		Yes			Yes	
Observations	403,912	403,912	403,912	403,912	329,010	329,010
R-squared	0.1251	0.1252	0.1251	0.1224	0.1348	0.1349

1. *** p<0.01, ** p<0.05, * p<0.1.
2. P-values in parentheses.
3. This table reports the estimates of Eq. 1 with the dependent variable being *Default*. Columns (1) to (4) show the results using the corporate broker sample, i.e., loans originated through corporate brokers; Columns (5) and (6) show the results using the consolidated corporate broker sample which removes loans that are likely to be conducted by incorporated individuals (i.e., a sole broker running as an incorporated entity). We conduct a propensity score match and remove loans in the corporate broker sample that are observationally similar to those in the sole broker sample. Specifically, we perform the nearest-2-neighbor matching based on the propensity scores computed from the logistic regression using all the control variables in Tables 3. This creates a matched sample of 74,902 loans which are removed from the corporate broker sample, resulting in an "uncontaminated" corporate broker sample with 329,010 observations.
4. We lag all the licensing regulation variables and market size one year to capture their effects on brokers at the time when the loan processing started.

Table 5 How Do Loan Characteristics and Borrowers' Features Vary with the Bonding and Net Worth Requirement?

Panel A. Sole Brokers

VARIABLES	Sole Brokers					
	FICO/100	*CLTV/100*	*Internal rating*	*Low-income*	*Stated doc*	*Job years*
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Bond_Net Worth)	0.002	-0.0023	-0.046**	-0.007**	-0.007**	0.113**
	(0.793)	(0.163)	(0.047)	(0.013)	(0.036)	(0.040)
Other license regulations control	Yes					
Year FE	Yes					
State FE	Yes					
Broker FE	Yes					
Observations	46,952	46,952	46,952	46,952	46,952	46,952
R-squared	0.292	0.188	0.259	0.329	0.292	0.234

Panel B. Pooled Sample

VARIABLES	Sole Brokers					
	FICO/100	*CLTV/100*	*Internal rating*	*Low-income*	*Stated doc*	*Job years*
	(1)	(2)	(3)	(4)	(5)	(6)
*Sole*Log(Bond_Net Worth)*	0.0012	-0.0026*	-0.0331**	-0.0052**	0.1112**	-0.004*
	(0.7238)	(0.0780)	(0.0386)	(0.0299)	(0.0140)	(0.089)
Other license regulations control	Yes					
Year FE	Yes					
State FE	Yes					
Broker FE	Yes					
Observations	352,506	352,506	349,986	352,506	352,506	352,506
R-squared	0.2779	0.1299	0.2238	0.2571	0.2170	0.254

Panel C. Corporate Brokers

VARIABLES	Sole Brokers					
	FICO/100	*CLTV/100*	*Internal rating*	*Low-income*	*Stated doc*	*Job years*
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Bond_Net Worth)	0.005***	-0.0013***	0.012*	0.003***	-0.001	0.006
	(0.008)	(0.002)	(0.052)	(0.008)	(0.635)	(0.789)
Other license regulations control			Yes			
Year FE			Yes			
State FE			Yes			
Broker FE			Yes			
Observations	414,154	414,154	414,154	414,154	414,154	414,154
R-squared	0.239	0.147	0.209	0.239	0.218	0.188

1. *** p<0.01, ** p<0.05, * p<0.1.
2. P-values in parentheses.
3. Panel A presents the estimates using a sample containing loans originated through sole brokers. Since some control variables have missing observations, we exclude these control variables, resulting in a sample size that is slightly larger than the baseline sole broker sample.
4. Panel B presents the estimates using a sample containing loans originated through both sole brokers and corporate brokers. Since some control variables are excluded because of missing observations, the sample size is slightly larger than the baseline pooled sample.
5. Panel C presents the estimates using a sample containing loans originated through corporate brokers. Since some control variables are excluded because of missing observations, the same size is slightly larger than the baseline corporate broker sample.
6. We lag all the licensing regulation variables and market size one year to capture their effects on brokers at the time when the loan processing started.

Table 6 APR and Loan Amount

	Sole Brokers				Pooled Sample		Corporate Brokers			
	APR		*Log(loan amount)*		*APR*	*Log(loan amount)*	*APR*		*Log(loan amount)*	
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Log(Bond_Net Worth)	0.04***	0.017***	-0.01**	-0.01***			-0.01***	-0.01***	-0.000	-0.001
	(0.000)	(0.004)	(0.039)	(0.003)			(0.000)	(0.000)	(0.792)	(0.204)
*Sole*Log(Bond_Net Worth)*					0.012**	-0.006*				
					(0.05)	(0.064)				
Regulation Index control	Yes		Yes		Yes	Yes	Yes		Yes	
Separate regulation components control		Yes		Yes				Yes		Yes
Other license regulations control										
Loan characteristics control						Yes				
Property characteristics control						Yes				
Borrower characteristics control						Yes				
Year FE						Yes				
State FE						Yes				
Broker FE						Yes				
Observations	45,172	45,172	45,172	45,172	226,094	226,094	403,912	403,912	403,912	403,912
R-squared	0.792	0.793	0.729	0.729	0.7851	0.6585	0.770	0.7696	0.661	0.661

1. *** p<0.01, ** p<0.05, * p<0.1.
2. P-values in parentheses.
3. Columns (1), (2), (5), (7) and (8) present the estimates of Eq.1 with the dependent variable being *APR* using the baseline sole broker sample, pooled sample, and corporate broker sample, respectively. Columns (3), (4), (6), (9) and (10) present the estimates of Eq.1 with the dependent variable being *Log(loan amount)* using the baseline sole broker sample, pooled sample, and corporate brokers sample, respectively.
4. We lag all the licensing regulation variables and market size one year to capture their effects on brokers at the time when the loan processing started.

Table 7 Response Dynamics to Changes in Surety Bond/Net Worth Requirement

	Event Year Dummies in level			Event Year Dummies interacted with *Log(Bond_Net Worth)*		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	*APR*	*Log(loan amount)*	*Default*	*APR*	*Log(loan amount)*	*Default*
1 year prior to the change	0.068	-0.019	-0.049	0.008	-0.001	-0.001
	(0.687)	(0.716)	(0.289)	(0.621)	(0.827)	(0.675)
Year of change	0.073	-0.058	-0.012	-0.001	-0.005	-0.001
	(0.484)	(0.115)	(0.571)	(0.914)	(0.392)	(0.789)
1 year after the change	0.211**	-0.057	-0.055**	0.016*	-0.006*	-0.006***
	(0.043)	(0.108)	(0.015)	(0.086)	(0.052)	(0.002)
2 years after the change	0.073	-0.025	0.006	0.005	-0.002	0.001
	(0.399)	(0.350)	(0.709)	(0.522)	(0.364)	(0.630)
3 years after the change	0.048	-0.084***	-0.057***	0.001	-0.008***	-0.005***
	(0.621)	(0.005)	(0.001)	(0.940)	(0.003)	(0.000)
4 years after the change	0.134	-0.003	-0.003	0.010	-0.001	-0.000
	(0.416)	(0.941)	(0.905)	(0.493)	(0.777)	(0.954)
Other license regulations control		Yes			Yes	
Loan characteristics control		Yes			Yes	
Property characteristics control		Yes			Yes	
Borrower characteristics control		Yes			Yes	
Year FE		Yes			Yes	
State FE		Yes			Yes	
Broker FE		Yes			Yes	
Observations	9,554	9,554	9,554	9,554	9,554	9,554
R-squared	0.741	0.678	0.216	0.741	0.677	0.216

1. *** p<0.01, ** p<0.05, * p<0.1.
2. P-values in parentheses.
3. This table presents the analyses on the response dynamics as specified in Eq. 2. The estimates are based on a subsample that is restricted to sole broker-originated loans from states with only one change in surety bond or net worth requirement from 1997 to 2006. The dependent variables are *APR, log(loan amount),* and *default*, respectively. Note that there are two model specifications: Columns (1) to (3) are estimates from the model with only event year dummies; and in Columns (4) to (6), each of the year dummies interact with bonding and net worth requirements *(Log(Bond_Net Worth)*) as an alternative specification. To conserve space, the estimates for control variables are not reported. Other provisional variables, controls for loan characteristics, and demographic features remain the same as specified in Table 3.
4. We lag all the licensing regulation variables and market size one year to capture their effects on brokers at the time when the loan processing started.

Table 8 Heterogeneity Analysis by Loan Type and Geography

Dependent. Variable: *Default*

VARIABLES	Stated-doc loans	Full-doc loans	Sand states	Other states	States with financial requirement
	(1)	(2)	(3)	(4)	(5)
Log (bond_net worth)	-0.006**	-0.005***	-0.067***	-0.005***	-0.005***
	(0.036)	(0.005)	(0.000)	(0.007)	(0.007)
Other license regulations control	Yes			Yes	
Loan characteristics control	Yes			Yes	
Property characteristics control	Yes			Yes	
Borrower characteristics control	Yes			Yes	
Year FE	Yes			Yes	
State FE	Yes			Yes	
Broker FE	Yes			Yes	
Observations	21,494	25,458	31,663	15,289	13,416
R-squared	0.281	0.228	0.174	0.204	0.200

1. *** p<0.01, ** p<0.05, * p<0.1.
2. P-values in parentheses.
3. This table presents the results from repeating the estimate of Eq. 1 using five different subsamples, where the dependent variable is *default*. The results shown in Column (1) are confined to stated documentation loans originated through sole brokers, and Column (2) represents results from full documentation loans with sole brokers. Column (3) represents the result from sole broker-originated loans from sand states (AR, CA, FL and NV), and column (4) shows the estimates based on sole broker-originated loans from the remaining 47 states. Lastly, the results shown in Column (5) are based on a subsample that excludes sole broker-originated loans from states where the bonding and net worth requirements are absent throughout the sample period 1997–2006.
4. All control variables are the same as those included in Tables 3 and 4. We lag all the licensing regulation variables and market size one year to capture their effects on brokers at the time when the loan processing started.

Table 9 Welfare Loss: Do Sole Brokers Overreact in Response to Higher Financial Requirement?

Panel A: Rejection Rate

Dependent. Variable: *Reject*

VARIABLES	Sole Brokers		Corporate Brokers		Pooled Sample
	(1)	(2)	(3)	(4)	(5)
Log(Bond_Net Worth)	0.007***	0.008***	0.003***	0.002***	
	(0.000)	(0.000)	(0.000)	(0.001)	
*Sole*Log(Bond_Net Worth)*					0.006***
					(0.001)
Regulation Index control	Yes		Yes		Yes
Separate regulation components control		Yes		Yes	
Loan characteristics control				Yes	
Property characteristics control				Yes	
Borrower characteristics control				Yes	
Year FE				Yes	
State FE				Yes	
Broker FE				Yes	
Rejection rate (%)	19.74	19.74	17.44	17.44	18.27
Observations	78,759	78,759	676,700	676,700	780,288
R-squared	0.260	0.260	0.263	0.262	0.262

1. *** p<0.01, ** p<0.05, * p<0.1.
2. P-values in parentheses.
3. This table presents the estimates of Eq. 1 with the dependent variable being *Reject*. Columns (1) and (2) are estimates using a sample with loan applications with sole brokers. Columns (3) and (4) are estimates using a sample with loan applications with corporate brokers. Column (5) shows the result based on a sample with loan applications with both sole and corporate brokers.
4. All control variables are the same as those included in Tables 3 and 4. We lag all the licensing regulation variables and market size one year to capture their effects on brokers at the time when the loan processing started.

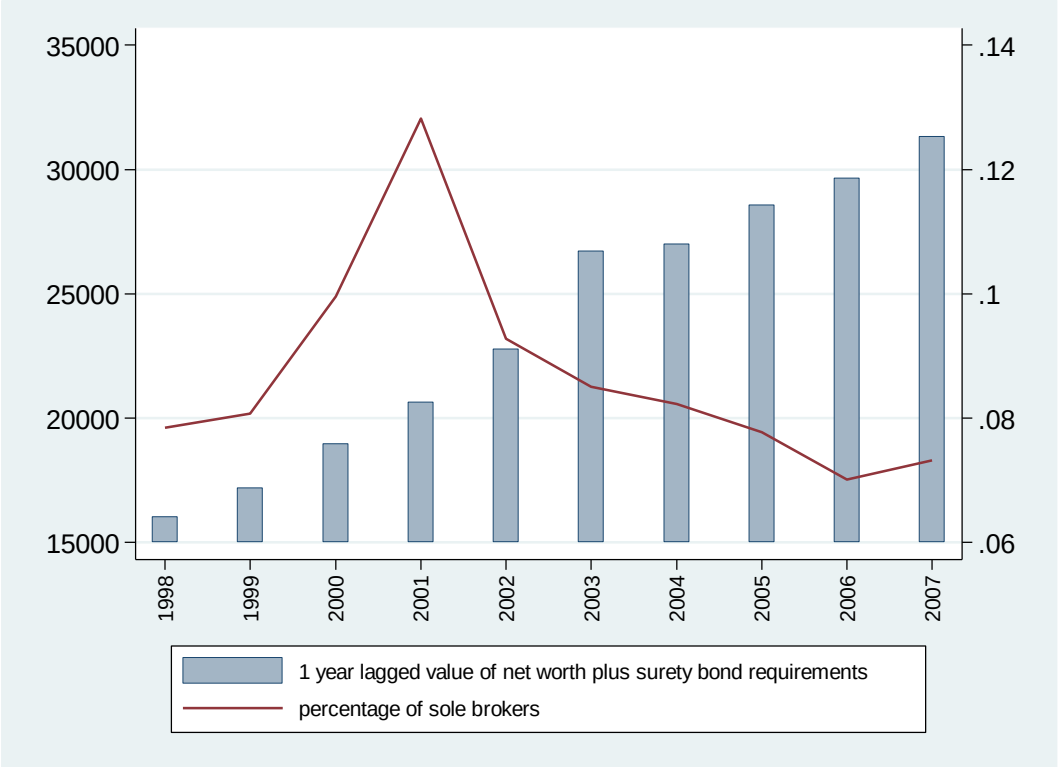
Panel B: Default Risk of Counterfactual Funded Loans

Dependent. Variable: *Default*

VARIABLES	All Sole-rejected borrowers	All Sole-rejected High-FICO borrowers	All Sole-rejected Low-income borrowers
	(1)	(2)	(3)
Sole-rejected	-0.007***	-0.015***	-0.014***
	(0.008)	(0.001)	(0.000)
License regulations control		Yes	
Loan characteristics control		Yes	
Property characteristics control		Yes	
Borrower characteristics control		Yes	
Year FE		Yes	
State FE		Yes	
Broker FE		Yes	
No. of counterfactual funded loans	5998	2773	2350
Observations	403,912	403,912	403,912
R-squared	0.122	0.122	0.122

1. *** p<0.01, ** p<0.05, * p<0.1.
2. P-values in parentheses.
3. This table presents the estimates using the baseline corporate brokers sample, with the dependent variable being *Default*. *Sole-rejected* is an indicator that takes a value of 1 if the loan is propensity-score matched with those in unfunded loan applications with sole brokers.
4. Column (1) reports the estimates using the baseline corporate brokers sample with 5,998 matched loans that are observationally similar to those unfunded loans with sole brokers. Column (2) reports the estimates using the baseline corporate brokers sample with 2,773 matched loans that are observationally similar to those unsuccessful but high-FICO scores applicants with sole brokers. Column (3) reports the estimates using the baseline corporate brokers sample with 2,350 matched loans that are observationally similar to those low-income unsuccessful applicants with sole brokers.
5. We lag all the licensing regulation variables and market size one year to capture their effects on brokers at the time when the loan processing started.

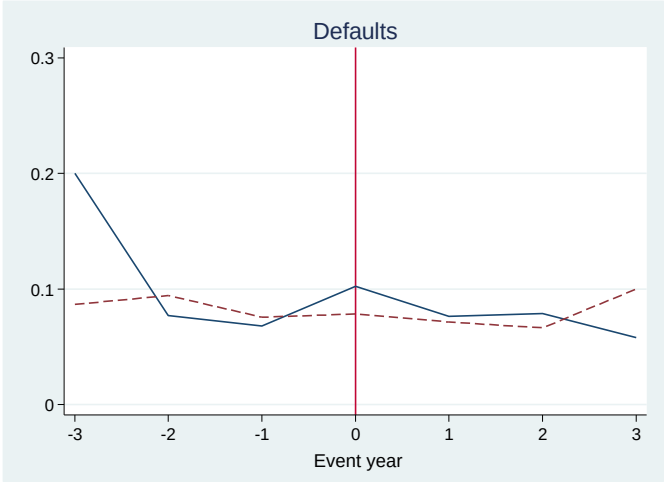
Figure 1 Percentage of Sole Brokers and Bond and Net Worth Requirements Over the Years



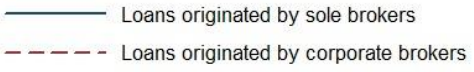
Source: NCFC dataset and authors' self-calculation.

The line represents the fraction of sole brokers out of all brokers in each of the years from 1998 to 2007. The bar chart represents the one year lagged national average value of bonding and net worth requirements. This figure shows that the fraction of sole brokers to corporate brokers is decreasing as bond and net worth requirements increase over time.

Figure 2 Response Dynamics to Changes in the Financial Credibility Requirement

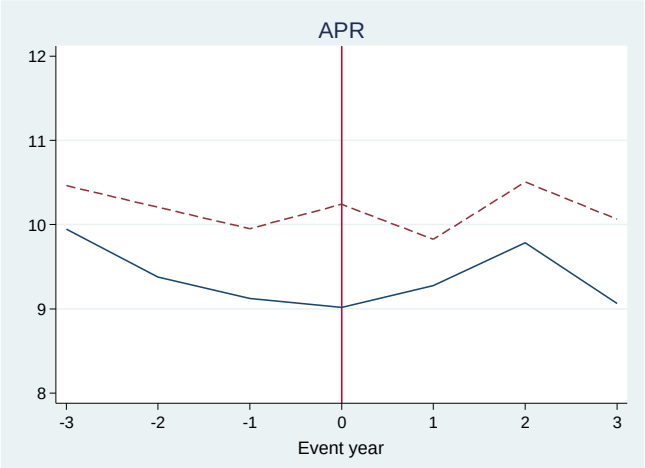


(a)

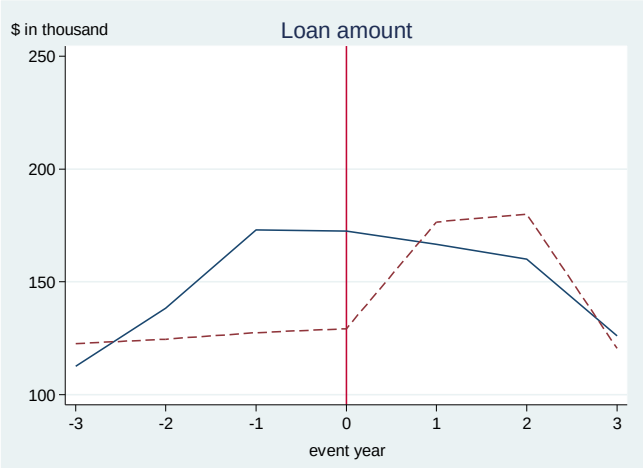


Source: NCFC dataset and authors' self-calculation.

The figures show the average default rate (a), APR (b), and loan amount (c) of loans through sole brokers and corporate brokers before and after the adjustment in surety bond and net worth requirements. Note that the sample for Figure 2 (a) to (c) is restricted to states with one change in surety bond and net worth requirements.

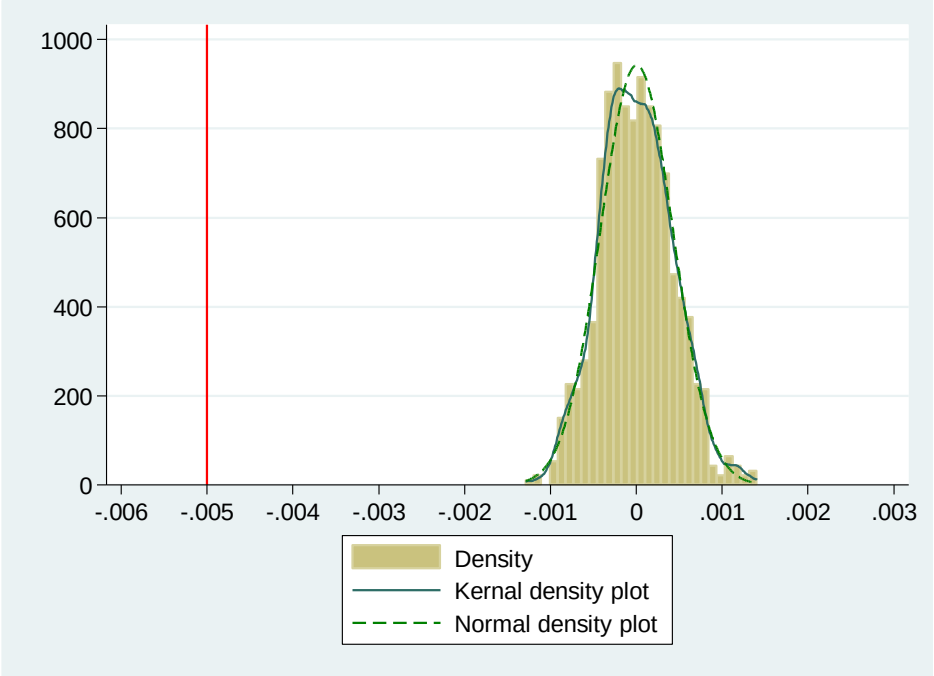


(b)

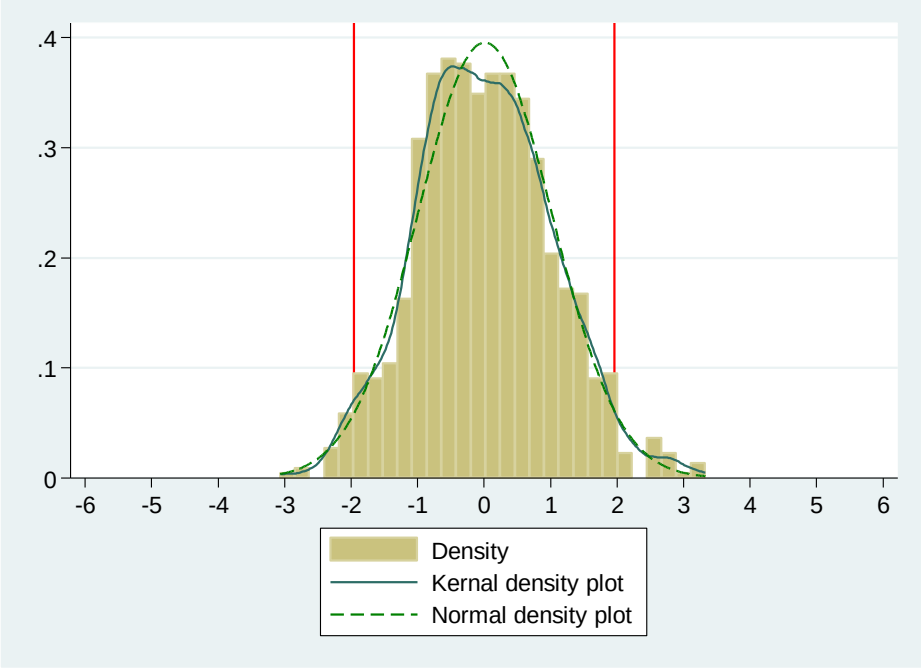


(c)

Figure 3 The Distribution Plots on Parameter Estimates and t-values from Falsification Tests



(a) Distribution of Parameter estimates
Note that the estimated coefficients are multiplied by 10000



(b) Distribution of T-values

These figures present (a) the distribution of parameter estimates, and (b) the corresponding t-value of loan defaults in response to randomly assigned bonding and net worth requirements. The estimates are calculated in the same way as those presented in Columns (1) to (4) in Table 3.

Appendix

Table A 1 Variable Definitions

Variable name	Definition
Sole	An indicator variable takes a value of 1 if the loan was originated through a sole broker and 0 otherwise.
Default	An indicator variable takes a value of 1 if the loan has become delinquent for 60 days within the first 24 months following origination, and 0 otherwise.
Reject	An indicator variable takes a value of 1 if the loan application is denied (i.e., HMDA action taken code=3), and 0 otherwise.
Sole-rejected (Applied to corporate broker sample only)	An indicator variable that takes a value of 1 if the loan is propensity-score matched, i.e., a loan that would not be rejected if a corporate broker was involved instead of a sole broker.
LICENSE REGULATIONS	
Bond_Net Worth	Sum of the dollar amount of surety bonds and net worth requirements for licensing.
Log(Bond_Net Worth)	The logarithm of variable *Bond_Net Worth*.
Regulation Index_S	This measures the additional regulation restrictiveness for sole brokers. It is the summation of the numerical code for 9 licensing components namely, education requirement for the licensee, exam requirement for the licensee, experience requirement for the licensee, continue education requirement for the licensee, education requirement for the managing principal (if any), additional license for the managing principal (if any), exam requirement for the managing principal (if any), experience requirement for the managing principal (if any), continue education requirement for the managing principal (if any).
Regulation Index_C	This measures the additional regulation restrictiveness for corporate brokers. It is an index calculated by subtracting the numerical codes assigned to surety bond and net worth requirements from the summated value, i.e., the Pahl's index. In other words, this index represents the summation of the remaining 22 occupational licensing components which exclude net worth and surety bonds requirements
Additional License_S	Regulation of managing principals (Licensed/registered as individual mortgage broker = 2; Licensed/registered as employee = 1; None = 0).
Additional License_C	Summation of the following three components: licensing/registration of entities, sole proprietors, and individual acting as mortgage brokers (Licensed/registered = 1; None = 0); Regulation of managing principals (Licensed/registered as individual mortgage broker = 2; Licensed/registered as employee = 1; None = 0); Employees regulated (Employees regulated = 1; Employees not regulated = 0).
Education_S	Specific education requirement for licensing/registration (Required of many principals = 2; Required of one principal = 1; None = 0).
Education_C	Summation of the following three components: Specific education requirement for licensing/registration (Required of many principals = 2; Required of one principal = 1; None = 0); Specific education required for managing principal status (Required = 1; None = 0); Specific education requirement for licensing/registering employee (Required = 1; None = 0).
Continue Education_S	Continuing education requirement for licensing/registration (Required of many principals = 2; Required of one principal = 1; None = 0).
Continue Education_C	Summation of the following three components: Continuing education

	requirement for licensing/registration (Required of many principals = 2; Required of one principal = 1; None = 0); Continuing education for managing principal (Required = 1; None = 0); Continuing education for employee (Required = 1; None = 0);
Experience_S	Specific experience requirement for licensing/registration (Required of many principals = 2; Required of one principal = 1; None = 0).
Experience_C	Summation of the following three components: Specific experience requirement for licensing/registration (Required of many principals = 2; Required of one principal = 1; None = 0); Specific experience required for managing principal status (Required = 1; None = 0); Specific experience requirement for licensing/registering employee (Required = 1; None = 0).
Exam_S	Examination required to obtain license/registration (Required of many principals = 2; Required of one principal = 1; None = 0).
Exam_C	Summation of the following three components: Examination required to obtain for licensing/registration (Required of many principals = 2; Required of one principal = 1; None = 0 Examination required for managing principal status (Required = 1; None = 0); Examination requirement for licensing/registering employee (Required = 1; None = 0).
Experience or Education_C	The maximum of variables *Experience_C* and *Education_C.*
Experience or Exam_C	The maximum of variables *Experience_C* and *Exam_C.*
LOAN CHARACTERISTICS	
APR	A proxy for loan price, representing the annual cost of a loan.
Log(Loan Amount)	The logarithm of the unpaid principal balance at origination.
FICO	The score that summarizes the borrower's creditworthiness at loan origination.
DTI	Disclosure of the borrower's debt to income ratio at loan origination.
CLTV	Disclosure of the combined loan-to-value ratio at loan origination.
Internal rating	An integer ranging between 1 and 20 assigned by the lender with the intention to measure the riskiness of the loan. This variable was assigned during the loan application process.
Fixed rate	An indicator variable takes a value of 1 if the loan is a fixed-rate loan, and 0 otherwise.
Prepayment penalty	An indicator variable takes a value of 1 if the loan comes with a prepayment penalty, and 0 otherwise.
Stated doc	An indicator variable takes a value of 1 if the loan is a stated documentation loan, and 0 otherwise.
Interviewed	An indicator variable takes a value of 1 if there was a face-to-face interaction between a mortgage broker and the borrower prior to the funding of the loan, and 0 otherwise.
Purchase	An indicator variable takes a value of 1 if the loan is for home purchase purpose, and 0 otherwise.
No cash-out refinance	An indicator variable takes a value of 1 if the loan is to refinance without cash-out, and 0 otherwise.
Cash-out refinance	An indicator variable takes a value of 1 if the loan is to refinance with cash-out, and 0 otherwise.
PROPERTY CHARACTERISTICS	
Primary residence	An indicator variable takes a value of 1 if the pledged property is owner-occupied, and 0 otherwise.
Second home	An indicator variable takes a value of 1 if the pledged property is the second home, and 0 otherwise.
Investment	An indicator variable takes a value of 1 if the pledged property is an investment property, and 0 otherwise.
BORROWER CHARACTERISTICS	
Married	An indicator variable takes a value of 1 if the borrower is married, and 0

	otherwise.
Single	An indicator variable takes a value of 1 if the borrower is single, and 0 otherwise.
Separated	An indicator variable takes a value of 1 if the marital status of the borrower is separated, and 0 otherwise.
Borrower age	Indicates the age of the primary borrower
Minority	An indicator variable takes a value of 1 if the borrower is a minority (not a member of the white race), and 0 otherwise.
Female	An indicator variable takes a value of 1 if the borrower is a female, and 0 otherwise
Job years	Indicates the borrower's working experience (in year).
Fixed income	An indicator variable takes a value of 1 if the borrower has fixed income, and 0 otherwise.
Self-employed	An indicator variable takes a value of 1 if the borrower is self-employed, and 0 otherwise.
Number of dependents	Disclosure of the number of dependents of the primary borrower.
Low-income borrowers	An indicator variable takes a value of 1 if the borrower's income is below the bottom 25th percentile among all borrowers in the sample, and 0 otherwise.
Market size	Number of HMDA loan originations in a given state each year divided by the sum of HMDA loan originations in all 50 states each year.