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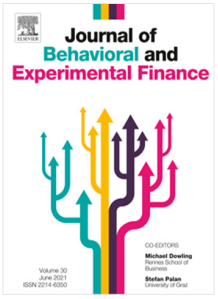

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Title Page with Author Information

Déjà Vu: CEO Overconfidence and Bank Mortgage Lending in the Post-Crisis period*

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Déjà Vu: CEO Overconfidence and Bank Mortgage Lending over the Post-Financial Crisis

Abstract

This study examines the impact of CEO overconfidence on banks' mortgage lending decisions in the post-financial crisis period. We find that banks with overconfident CEOs are more likely to approve mortgage loan applications of risky borrowers. Overconfident CEOs contribute to the riskiness of mortgage lending by encouraging banks to take on more risk. The positive effect of CEO overconfidence is more pronounced in banks with powerful CEOs, weak governance, low levels of technology adoption, and limited competition. Although improved bank regulations and intensified monitoring following the crisis have reduced the magnitude of this positive impact, it still exists, albeit to a lesser extent. Our findings remain consistent after endogeneity corrections and a battery of robustness tests. Overall, this study provides additional evidence of CEO overconfidence in shaping bank lending policies.

Key Words: CEO overconfidence; mortgage loan approval; corporate governance; financial crisis

JEL classification: G21; G30; G32;

1. Introduction

A sharp rise in mortgage default rates caused the global financial crisis of 2007-2009, and the explosion in risky subprime lending and securitization was held accountable for the unprecedented crisis (U.S. Financial Crisis Inquiry Commission, 2011).[1] Bernanke (2010) express serious concerns about the overconfidence of lenders in easing mortgage lending standards before the crisis, as reflected by the decline in the required down payments on house purchases and the expansion of mortgage loans to less-qualified borrowers on increasingly easy terms.[2] Keys et al. (2010) confirm that securitization practices adversely affect the screening incentives of subprime lenders. Despite the recognition that an overconfident attitude of banks could lead to risky lending policies, the direct linkage between bank CEO confidence and approvals of risky mortgage applications is neglected by the previous literature. CEOs are generally the top decision-makers of financial institutions, thereby playing a significant role in determining lending policies (e.g., Pathan, 2009; Ho et al., 2016). A natural question is, do overconfident CEOs have a tendency to encourage banks to accept risky mortgages by relaxing lending standards? To what extent do they do so? Given the intensifying bank regulation and supervision following the financial crisis (i.e., *Dodd-Frank Act*; *Basel III; Financial Reform Act*), does the influence of CEO confidence persist during the post-crisis period? To fill this gap in the literature, we explore the impact of overconfident CEOs on risky mortgage originations.

Overconfident CEOs generally believe that they are better than others in terms of skill and judgment or in gauging future prospectus (Heaton, 2002; Gervais et al., 2011). Their

[1] See the Final Report of the National Commission on the Causes of the Financial and Economic Crisis in the United States. Washington, DC: Financial Crisis Inquiry Commission.

[2] In a speech delivered on September 2, 2010, Bernanke, the 14th Chairman of the Federal Reserve System, stated, "leverage tends to be procyclical – rising in good times, when the confidence of lenders and borrowers is high, and falling in bad times when confidence turns to caution. This procyclicality increases financial and economic stress in the downturn."

overoptimistic beliefs affect various corporate decisions, such as investment (e.g., Malmendier and Tate, 2005; Malmendier and Tate, 2008), capital structure (Malmendier et al., 2011), and innovation (e.g., Galasso and Simcoe, 2011; Hirshleifer et al., 2012). Financial institutions are also subject to the influence of managerial beliefs. For example, optimistic and overconfident bank CEOs are associated with more liquidity creation (Huang et al., 2018), worse financial performance (Ma, 2015), and higher leverage (Ho et al., 2016). Despite the tightening regulations and monitoring during the post-crisis period, overconfident CEOs might be more optimistic about future outcomes and therefore are more likely to adopt risky lending policies as compared with their counterparties. In this vein, we posit that overconfident CEOs encourage risk-taking within their banks, which leads to more risky mortgage approvals.

This study examines the impact of CEO confidence on risky mortgage approvals by using the loan-level mortgage application data from the *Home Mortgage Disclosure Act* (HMDA). Prior literature primarily relies on bank-level data to identify the bank's lending policies (e.g., Ho et al., 2016; Huang et al., 2018). As compared with the bank-level real estate loan data, the loan-level data have the following three major advantages (Chu et al., 2021). First, the loan-level data provides information on borrower characteristics, which enables us to separate the effect of CEO overconfidence from demand-side factors. For example, applicant characteristics such as borrower income, age, race, and gender can be controlled. Second, the loan approval decisions at the origination reflect the ex-ante risk-taking behaviors of banks with overconfident CEOs, as compared with the ex-post risk-taking measures adopted by some other banking studies (Houston and James, 1995). If CEO overconfidence increases risky mortgage origination, the overall risk-levels of mortgages would increase.

In the empirical analysis, we first compare the loan-to-income ratios of mortgage applicants approved by banks with overconfident CEOs to those approved by banks with non-overconfident CEOs. The loan-to-income ratios of mortgage applications approved by banks with overconfident CEOs are significantly higher than those approved by banks with non-overconfident CEOs, implying that CEO overconfidence can be an important factor in risky mortgage approvals. Then we follow Duchin and Sosyua (2014) by regressing mortgage approvals on the interaction between CEO overconfidence and loan-to-income ratio. The loan-to-income ratio captures the riskiness of mortgage applications. Therefore, the interaction between CEO overconfidence and loan-to-income ratio indicates the effect of bank CEO overconfidence on risky mortgages. The results show positive relationships between the interaction variable and mortgage approvals during the post-crisis period of 2010-2017, supporting our conjecture that banks with overconfident CEOs are more likely to approve risky mortgage applications.

We next examine whether the effect of CEO overconfidence differs across banks with different governance, technology adoption, and competition levels. Our cross-sectional results first show that the positive relation between bank CEO overconfidence and risky mortgage approvals is stronger among banks with weaker CEOs and less effective board structures. This is consistent with the notion that CEOs have more discretion to affect banking decisions when decision-making power is centralized (Liu and Jiraporn, 2010), and an effective board structure could curb the effect of CEO overconfidence on banks' risk-taking behavior (Mollah et al., 2021). In addition, we find that the impact of CEO overconfidence on loan decisions is less significant in banks with a higher level of technology adoption, suggesting that automated underwriting systems can minimize the influence of human biases, such as overconfidence. Lastly, the effect of CEO overconfidence is

less prominent in less competitive markets, indicating that banks with overconfident CEOs are more cautious in their lending practices in response to increased competition.

CEO overconfidence could be endogenously determined and correlated with other unobservable demand- and supply-side factors. Therefore, our results are subject to endogeneity concerns. We address the issue by adopting the following four methods: (1) adding fixed effects from different dimensions; (2) using a matched analysis at the mortgage loan level; (3) adopting a propensity score-matching (PSM) approach; and (4) implementing a two-stage instrumental variable (IV) approach. The results hold after considering the potential selection bias and endogeneity concerns.

Our findings are also robust to alternative measures for mortgage riskiness and CEO overconfidence. In addition, CEO overconfidence increases the bank-level loan approval rates and the proportion of non-performing loans, suggesting that our statistical significance is not blown up by using loan-level regressions. Lastly, we show that while the improved bank regulations and intensified monitoring following the financial crisis of 2007-2009 significantly reduce the impact magnitude of overconfident bank CEOs, it persists, albeit to a lesser extent.

This study contributes to the literature in the following ways. First, we provide additional insights into the role of managerial character traits in influencing banks' risk-taking behavior. A number of studies have investigated how CEOs and their character traits affect the investment decisions of industrial firms (e.g., Malmendier and Tate, 2008; Malmendier et al, 2011), but few have examined the role of CEO character traits in the banking industry. Compared with banks without overconfident CEOs, overconfident banks underwrite more real estate loans (Ma, 2015), experience higher default risk (Burg et al., 2012), and have higher annual changes in real estate loans and leverage during the crisis period (Ho et al., 2016). We extend these studies by

investigating how CEO overconfidence affects banks' ex-ante risk-taking, namely the riskiness of mortgage originated. Our study is closely related to Chu et al. (2021) which also uses loan-level data to examine the effect of CEO option compensation on banks' incentives to originate risky mortgages. Second, we extend previous studies by investigating whether the effect of CEO overconfidence persists in the post-crisis period. Ho et al. (2016) show that during the crisis period, banks with overconfident CEOs assume higher risk than other banks, and aggressive banks are more likely to have overconfident CEOs. Our findings show that CEO overconfidence positively affects risky mortgage approvals before, during, and after the crisis, which implies that CEO overconfidence persistently reflects banks' risk-taking policies.

The remainder of this paper proceeds as follows. Section 2 summarizes the related literature and develops hypotheses. Section 3 describes the data sources and variable definitions and provides summary statistics for the sample. Section 4 discusses the empirical analyses. Section 5 presents the robustness test. Section 6 concludes the paper.

2. **Literature review and hypothesis development**

The better-than-average effect is a well-documented phenomenon in the literature that can have a significant impact on corporate operations. For example, Heaton (2002) finds that overconfident CEOs systematically overestimate the probability of firms' favorable future outcomes and underestimate the probability of unfavorable future outcomes. Malmendier and Tate (2005) expand on the findings from Heaton (2002) by modeling the role of capital structure in shaping the impact of managerial overconfidence. They provide empirical evidence that the sensitivity of investment to cash flow is positively related to CEO overconfidence, particularly in equity-dependent firms. In a similar vein, Malmendier and Tate (2008) confirm that overconfident

managers overestimate their ability to create value by taking over other firms. This overestimation of merge synergies leads to overpaying for target firms and accepting value-destroying deals.

In contrast, some studies find that managerial overconfidence could have a positive impact on investment decisions. For example, Campbell et al. (2011) show that a moderate level of managerial overconfidence can curb investment distortion by prompting managers to invest at the first-best level and maximize shareholder value. Galasso and Simcoe (2011) and Hirshleifer et al. (2012) focus on the role of managerial overconfidence in shaping firms' investment in corporate innovations and find those overconfident CEOs are more likely to pursue innovations, which lead to more patents and greater innovation success.

Recent studies have investigated the impact of CEO overconfidence on corporate practices, such as bank loan contracting (Lin et al., 2020; Hsu et al., 2022), cash holdings (Aktas et al., 2019; Chen et al., 2020), corporate social responsibility (McCarthy et al., 2017; Sauerwald and Su, 2019), labor investment efficiency (Lai et al., 2021), and accounting performance (Chung and Hribar, 2021; Killins et al., 2021). Overall, these studies show that overconfident CEOs are more likely to hold excess cash, less likely to engage in corporate social responsibility, make less efficient labor investments, and more likely to engage in accounting manipulation.

Even though financial firms are subject to strict regulations, their operations are also influenced by the beliefs of their managers. Ma (2015) tests theories on how banks' pre-crisis investments were connected to their CEOs' managerial character traits. They find that optimistic CEOs were associated with larger housing investments and worse crisis performance. Huang et al. (2018) investigate the relationship between CEO optimism and banks' liquidity-creation decisions and find that banks with optimistic CEOs tend to create more liquidity than banks with less optimistic CEOs. This suggests that optimistic CEOs may overestimate the value of liquidity

creation and underestimate the associated risks. In addition, the positive impact of CEO optimism on liquidity creation is stronger in the financial crisis period. In the real estate literature, Eichholtz and Yönder (2015) study the effects of CEO overconfidence on corporate investment in U.S. Real Estate Investment Trusts (REITs). They document that *REITs* with overconfident CEOs invest more and conduct more acquisition activities when they have sufficient discretionary cash. In addition, compared with non-overconfident banks, banks with overconfident CEOs have a larger standard deviation in stock returns (Niu, 2010), and experience a higher annual rate of change in real estate loans and market leverage (Ho et al., 2016)

Overall, previous literature provides strong evidence that CEO overconfidence affects the risk-taking decisions of banks and enterprises. Such CEOs are more likely to be overly optimistic about future outcomes and encourage risk-taking within the banks. This may lead to staff underestimating the risk of lending to borrowers with a high probability of default, resulting in the origination of more risky mortgages. Therefore, we hypothesize that banks with overconfident CEOs are more likely to originate risky mortgage loans. Our hypothesis is thus stated as follows:

H1: Banks with overconfident CEOs are more likely to originate risky mortgage loans.

3. Empirical design

3.1 Data and sample construction

Our data comes from three main sources. The mortgage application data is collected from the *Home Mortgage Disclosure Act* (HMDA), which includes approximately 90 percent of mortgage lending in the U.S. (Dell'Ariccia et al., 2012; Duchin and Sosyura, 2014).[3] The loan-level data disclosed by lending institutions includes each applicant's characteristics, features of the

[3] The *HMDA* data can be retrieved from https://www.consumerfinance.gov/data-research/hmda/historic-data/.

mortgage loan, and the bank's decision. Since we focus on the impact of bank CEO overconfidence during the post-crisis period, we restrict our sample to the period from 2010 to 2017 in our main analysis.[4] We use Top Holder *RSSD ID* to merge with *FR Y-9C* reports obtaining the balance sheet and income statement data of bank holding companies (BHC).[5] Previous studies on bank lending also focus on the consolidated/BHC level, since bank lending policies are usually made at this level.[6] To merge with the *ExcecuComp* database, we use the link file from the Federal Reserve Bank of the New York website to obtain *PERMCO* for each BHC and then merge with *CRSP/COMPUSTAT* databases to get *GVKEY*.[7] Finally, we use the *GVKEY* to match the *ExcecuComp* database where we obtain executive compensation information and CEOs' option holdings data.[8]

In line with previous studies (Duchin and Sosyura, 2014; Chu and Qiu, 2021; Vojtech et al. 2020), we refined our sample by applying a series of data filters. These filters included: (1) removing incomplete or withdrawn mortgage applications; (2) including only conventional loans, because mortgage loans insured by the *Federal Housing Administration* (FHA), *Veterans Affairs* (VA), *Farm Service Agency* (FAS), and *Rural Housing Service* (RHS) receive government insurance and thus have different default risk exposures from that of conventional loans; (3) including new mortgage applications for home purchase and excluding those for home improvement or refinancing; (4) requiring loans to be used for financing residential units, and

[4] *The National Bureau of Economic Research (NBER)* defines the recent financial crisis as the period from December 2007 to June 2009.
[5] The Top Holder *RSSD ID* becomes available in the *HMDA* database since 2010.
[6] Bank holding companies (BHCs) are required by regulation to be a source of strength for their affiliated banks. Houston et al. (1997) find that bank loan growth depends on the BHC, suggesting that the loan growth of an affiliated bank is influenced by the financial strength of the BHC.
[7] The *PERMCO-RSSD* link table includes 1,182 bank holding companies in the United States. An unreported analysis shows that the banks listed in the link table represent the majority of bank holding companies in the *FR Y-9C* reports.
[8] We match loan-level data in year t with bank accounting information and CEO overconfidence measures in year t-1. Our results are also significant when we use the concurrent bank accounting information and CEO overconfidence measures.

excluding mortgages for manufactured housing; (5) excluding mortgage loans that are sold over the calendar year of origination. Sold loans are typically sold within 39 days of issuance and therefore have little impact on the banks' risk (Duchin and Sosyura, 2014). The final sample consists of 1,582,219 mortgage loan applications and 601 bank-year-level observations between 2010 and 2017.

3.2. Measure of bank CEO overconfidence

Following prior literature (e.g., Campbell et al., 2011; Ahmed and Duellman, 2013; Hsu et al., 2017; Chyz et al., 2019), we classify CEOs as overconfident or non-overconfident based on their option holdings. We first calculate the realizable value per share as the total realizable value of the exercisable options divided by the number of exercisable options. Then, we subtract the realized value per share from the stock price at the end of the corresponding fiscal year to obtain the estimated average exercise price. The average percent moneyness is a measure of how far in the money an option is, on average. An option is in the money if its realizable value per share is greater than its estimated average exercise price. A CEO is considered overconfident if she does not exercise an option that is at least 67 percent in the money twice or more. *Holder67* proxies for CEO overconfidence, and it is a binary variable that is set to 1 if a CEO does not exercise such an option and 0 otherwise.

3.3. Research design

In this section, we investigate whether banks with overconfident CEOs are more likely to originate risky mortgage loans. If CEO overconfidence leads to a CEO taking on more risk, the CEO is likely to implement lending policies that encourage risk-taking (Chu et al., 2021). Following Duchin and Sosyura (2014), we assume that the riskiness of mortgage applications is fixed. This is a reasonable assumption because borrowers are typically not aware of the

overconfidence of bank CEOs. As a result, they are unlikely to adjust their behavior based on the overconfidence of the CEO. The question is whether banks approve mortgages after receiving mortgage applications of a certain risk level. We follow Chu et al. (2021) and estimate the following equation:

$$Loan\ approval_{ijkt} = \beta_0 + \beta_1 Holder67_{jt-1} \times LTI_{ijt} + \beta_2 Holder67_{jt-1} + \beta_3 LTI_{ijt} + \beta_4 X_{ijt-1} + \alpha_j + \alpha_k + \alpha_t + \varepsilon_{ijkt} \quad (1)$$

where *i* refers to the loan application, *j* refers to the bank, *k* refers to the metropolitan statistical area, and *t* indicates the year. The dependent variable, $Loan\ approval_{ijkt}$, is a dummy variable that equals 1 if a loan application is approved, and 0 otherwise. $Holder67_{jt-1}$ is the CEO overconfidence measure. LTI_{ijt} refers to the loan-to-income ratio,[9] which is a measure of loan risk. Our key variable of interest, $Holder67_{jt-1} \times LTI_{ijt}$, is the interaction of the bank CEO overconfidence measure and the loan-to-income ratio. X_{ijt-1} is an array of bank-specific control variables (e.g., *Size*, *Capital*, *Sub debt*, *ROA*, *Charge-off*, *Non-Performing Loan*, *Liquidity*, and *Deposits*) and loan-specific control variables (e.g., *Male*, *White*, *Black*, *Hispanic*, and *Asian*).[10] We also add firm-fixed effects (α_j), metropolitan statistical area-fixed effects (α_k) and year-fixed effects (α_t) in our regressions. In all equations, we use heteroskedasticity consistent standard errors that are clustered at the bank level. This takes into account the fact that the residuals in mortgage loan approvals may be correlated within banks (Duchin and Sosyura, 2014).[11]

[9] Duchin and Sosyura (2014) point out that the loan-to-income ratio is a common measure of loan risk in the mortgage industry. For example, regulators adopt the loan-to-income ratio to evaluate whether a loan is eligible for the *Federal Home Affordable Modification Program*.

[10] We acknowledge that we are limited by the data we have available. The Home Mortgage Disclosure Act (HMDA) database only provides information on applicant income, race, ethnicity, loan amount, and lender name. As a result, we are unable to control for other borrower characteristics that may be important, such as their credit score, debt-to-income ratio, and employment history.

[11] We also cluster standard errors at the firm and MSA levels. Our results remain robust.

4. Empirical result

4.1. Summary statistics

Panel A of Table 1 presents descriptive statistics for our sample of mortgage applications. The *Loan approval* has a mean of 0.715, indicating that 71.5 percent of applications are approved. The *Loan-to-income ratio*, as a proxy of loan risk, has a mean of 2.888 and a standard deviation of 7.430, which indicates a significant variation. Among all the mortgage loan applicants, 66.7 percent are male, 69.6 percent are White, 4.9 percent are Black or African American, 8.0 percent are Hispanic or Latino and 12.6 percent are Asian. *Holder67* has a mean of 0.348, suggesting that on average 34.8% of our mortgage applications are handled by banks with overconfident CEOs. Other bank accounting variables have similar statistics to those reported by Duchin and Sosyura (2014).

Panel B of Table 1 presents the results of the univariate analysis between CEO overconfidence and the riskiness of approved mortgage loan applications. *Overconfidence* refers to banks with overconfident CEOs, whereas *non-overconfidence* refers to banks with CEOs of a lower level of confidence. Columns (1) and (2) report the mean and median of *LTI* in each subsample. Overconfident CEOs approve mortgage applications with a higher level of *LTI*, which has a mean (median) of 2.754 (2.630), while non-overconfident CEOs approve mortgage loan applications with a lower level of *LTI*, which has a mean (median) of 2.671 (2.579). Column (3) presents the results of the *t*-tests for the mean differences between the two subsamples and the Wilcoxon test for the median differences. As shown, the differences in mean (median) *LTI* are statistically significant. The average *LTI* of the *overconfidence* subsample is 0.083 higher than the average *LTI* of the *non-overconfidence* subsample, and the difference is significant at the 1% level. Our results suggest that the loans approved by overconfident CEOs are riskier than those approved

by non-overconfident CEOs, which supports *H1* that overconfident CEOs are more likely to approve risky mortgage loans.

[Insert Table 1 about here]

4.2. Bank CEO overconfidence and risky mortgage origination

Table 2 presents the OLS regression results on the effect of CEO overconfidence on risky mortgage origination, namely Eq. (1). Column (1) shows that the coefficient on $Holder67_{jt-1} \times LTI_{ijt}$ is 0.028 and statistically significant at the 5 percent level, implying that banks with overconfident CEOs are more likely to approve risky mortgage applications. Following Chu and Qiu (2021),[12] we consider a loan risky if its loan-to-income ratio is 3 or higher. Therefore, an increase of one standard deviation in CEO overconfidence leads to an increase of 4.01% $(0.028 \times 3 \times 0.477)$ in the approval rate of risky mortgages. The economic magnitude increases to 6.68% $(0.028 \times 5 \times 0.477)$ for risky loans with a loan-to-income ratio equaling 5. In Column (2), we include bank characteristics as regressors and the coefficient of the interaction term remains positive and statistically significant. Our results also show that smaller sizes and higher deposits are associated with higher risky mortgage approval rates. We include loan characteristics as regressors in Column (3) and obtain similar results. The results suggest that male and White applicants are more likely to get a risky mortgage approval, while Black, Hispanic, and Asian applicants have lower approval rates on risky mortgages. Both bank and loan characteristics are added as additional controls in the regression model and the results are presented in Column (4). The coefficient of $Holder67_{jt-1} \times LTI_{ijt}$ remains positive and statistically significant

[12] Chu and Qiu (2021) use a threshold of 3 as an example of risky loans because mortgage underwriting standards in the United States typically require the debt-to-income ratio to be lower than 28%. This implies that a loan-to-income ratio of around 3 would be considered risky.

coefficient.[13] Overall, our results suggest that banks with overconfident CEOs are more likely to approve risky mortgage applications, which is consistent with *H1*.

[Insert Table 2 about here]

4.3. Cross-sectional heterogeneity

In this subsection, we examine whether the effect of CEO overconfidence on risky mortgage approvals varies across banks with different governance, technology adoption, and competition levels.

4.3.1 Role of CEO power and corporate governance

We first investigate whether the association between CEO overconfidence and risky mortgage approvals is affected by CEO power which is defined by Finkelstein (1992) as CEOs' capacity to exert their will. Among top executives, bank CEOs have great discretion in their decision-making (Sariol and Abebe, 2017). For banks whose decision-making power is concentrated in the hands of CEOs, their lending policies are more likely to be affected by CEO beliefs (e.g., Liu and Jiraporn, 2010). Therefore, we expect the positive relationship between CEO overconfidence and risky mortgage approvals to be more pronounced for CEOs with greater power. Following prior literature[14] (e.g., Han et al., 2016), we use CEO tenure, CEO ownership, CEO duality, and CEO pay slice, as four proxies for CEO power. Then, we split the sample according to whether the CEO power is above the sample median.

[13] Our findings remain largely unaffected when we include CEO age and gender as additional control variables in the model.

[14] For example, Pan et al. (2016) suggest that CEO tenure can be a governance measure. Specifically, CEOs gain control over board over time which lead to severe agency issues, reflected by increasing investment quantity and decreasing investment quality. Finkelstein (1992) argues that greater CEO stock ownership reduces the influence of the board and enables the CEO to exercise more discretion in making decisions, thus increasing CEO power. Adam et al. (2005) find that the CEO has greater power if the CEO is also the chair of the company's board of directors. Bebchuk et al. (2011) show that the CEO's total compensation as a fraction of the total compensation for the firm's top five executives reflects the relative importance of the CEO as well as the extent to which the CEO is able to extract rents.

The results of the subsamples partitioned on the CEO tenure are presented in Columns (1) and (2) of Panel A, Table 3. The coefficients of $Holder67_{jt-1} \times LTI_{ijt}$ are positive and statistically significant across all subsamples but are higher for the long-serving CEOs subsamples, suggesting that overconfident CEOs are more likely to approve risky mortgage loans when they work longer at a bank. The results reported in Columns (3)-(8) show that the positive and significant coefficients of $Holder67_{jt-1} \times LTI_{ijt}$ only exist in the subsample of CEOs with greater ownership and CEO duality, suggesting that CEO ownership and duality strengthen the positive relationship between CEO overconfidence and risky mortgage approvals. The subsample results on the CEO pay slice are presented in Columns (7) and (8), with the coefficient of $Holder67_{jt-1} \times LTI_{ijt}$ positive and statistically significant in the high CEO pay slice subsample. Overall, the results in Panel A of Table 3 support our conjecture that overconfident CEOs with greater power are more likely to affect banks' risk-taking policies and approve risky mortgage loans.

Prior studies emphasize the important role of board structure in curbing CEOs' risk-taking behavior. For example, Srivastav and Hagendorff (2016) investigate how some key governance features such as bank boards, compensation structure, and risk management systems affect banks' risk-taking. Similarly, we posit that the positive impact of overconfident CEOs on risky loan approvals can be mitigated by better corporate governance mechanisms. To this end, we first follow Dong et al. (2021a) and use two proxies for governance quality: *Busy Board*, which is measured as the average number of board seats held by directors, and *Board Independence*, which is measured as the percentage of independent directors on the board. Then we split the sample based on whether the banks' governance quality is above the sample median.

The results are presented in Panel B of Table 3. Throughout Columns (1) to (4), we find that the coefficients of $Holder67_{jt-1} \times LTI_{ijt}$ are only significantly positive in subsamples with worse corporate governance. More importantly, the differences between the coefficients are also significant (Chi-square=31.89 and 27.74, respectively). Overall, the findings are in line with our expectation that high-quality governance could mitigate the risk-taking behavior of overconfident CEOs.

[Insert Table 3 about here]

4.3.2 Role of bank technology adoption

Automated underwriting systems have been adopted by financial institutions to facilitate decision-making since they can reduce costs, mitigate potential discrimination issues, etc. For example, the adoption of new screening technologies by commercial banks could significantly affect loan outcomes by assessing borrower credit risk faster and more accurately. In our context, we argue that the imprint of CEO overconfidence on loan decisions might be less significant with banks' level of technology adoption.[15] Empirically, we follow Tewari (2014) and use two proxies, namely the interest rate volatility, and lending productivity. Low-interest rate volatility (the standard deviation of interest rates) and high lending productivity (number of loans per employee) indicate high technology adoption. We divide the sample into low- and high-subsamples based on median values of interest rate volatility and lending productivity.

The results are reported in Table 4. The coefficients of the interaction term $Holder67_{jt-1} \times LTI_{ijt}$ are positive and significantly larger in Columns (1) and (3), with the difference in p-values significant at 5% and 1% levels, respectively. These findings are consistent

[15] We thank an anonymous referee for suggesting this heterogeneity test.

with our expectations that overconfident CEOs play a more important role in affecting the lending decisions of banks with lower technology adoption.

[Insert Table 4 about here]

4.3.3 Role of bank competition

Theoretically, bank competition can have both positive and negative effects on the relationship between CEO overconfidence and banks' lending decisions (Bushman et al., 2016).[16] On the one hand, the competition-fragility theory suggests that banks are incentivized to take on more risks when the competition level increases (Keeley, 1990). Based on this theory, overconfident CEOs might become more aggressive in their lending strategies in order to generate high profits and gain competitive advantages. If this is the case, bank competition will positively affect the relationship between CEO overconfidence and risky mortgage approvals. On the other hand, the competition-stability theory posits that competition promotes efficiency, innovation, and risk management in the banking sector, which mitigates the potential negative effects of financial shocks and crises. In response to increased competition, overconfident CEOs may take a more cautious approach to lending by becoming more selective in their lending practices or focusing on lower-risk investments. Therefore, the competition-stability theory predicts that bank competition moderates the effect of CEO overconfidence on risky mortgage approvals.

To empirically test the above conjectures, we follow Beyhaghi et al. (2022) and use three proxies (number of banks, Deposit *HHI*, and Mortgage loan *HHI*)[17] at the MSA level for bank

[16] We thank an anonymous referee for the suggestion.

[17] We measure the concentration of deposits using the notion of a Herfindahl-Hirschman Index of bank deposit:

$$Deposit\ HHI = \sum_{i=1}^{n} Bank\ deposit_i^2$$

where n is the number of banks in an MSA, and *Deposit HHI* is the fraction of deposit of bank i in an MSA. A high level of $Bank\ deposit_i$ means that a large proportion of deposits come from bank i. *Deposit HHI*, as an application of the Herfindahl-Hirschman Index, captures the relative concentration of each bank in an MSA. *Deposit HHI* ranges

competition. We split the full sample into high and low-bank competition subsamples and present the results in Table 5. The coefficients of $Holder67_{jt-1} \times LTI_{ijt}$ are significantly larger in low-bank competition subsamples (see Columns (1), (3), and (5)). Overall, these results are consistent with the competition-stability theory that bank competition moderates the effect of CEO overconfidence on risky mortgage approvals.

[Insert Table 5 about here]

4.4 Potential channel: Bank risk-taking

In this subsection, we examine whether CEO overconfidence affects individual loan approval through bank risk-taking. Overconfident CEOs are more likely to promote risky lending practices, which can increase a bank's overall risk appetite. This can lead to loan officers underestimating the risk of lending to borrowers with a high probability of default, resulting in the origination of more risky mortgages. To empirically test this argument, we examine whether banks with overconfident CEOs take greater risks in general. In this study, we use two sets of proxies for bank risk-taking. First, we follow Basu et al. (2021) and use three risk-taking measures based on bank performance, namely *equity return volatility*, *earnings volatility*, and *cash flow volatility*. Second, we follow Kravet and Muslu (2013) and use a text-based analysis to capture banks' risk levels. Specifically, we use the U.S. *Public Company Annual Report Risk Metrics* Database and construct two proxies for risk-taking, namely *Risk level* and *Downside risk rising*. *Risk level* is the number of six risk-related words ("risk", "risks", "risky", "uncertain", "uncertainty", and "uncertainties") in the annual report divided by the total number of words (Li et al., 2006).

between 0 and 1, where lower values correspond to the lower market concentration and *vice versa*. The Mortgage loan *HHI* is constructed using a similar method.

Downside risk rising is a dummy variable indicating whether the increase in the downside risk of a bank is higher than that of the median average of all banks.

Table 6 presents the results. The coefficients of *Holder67* are significantly positive in Columns (1)-(5), suggesting that overconfident CEOs are associated with greater risk-taking, as reflected in both bank performance and financial reports. The results are consistent with Niu et al. (2010) and Ma et al. (2015) that bank risk-taking is affected by managerial traits.

[Insert Table 6 about here]

5. Robustness checks

In this section, we conduct a battery of robustness checks to ensure that our findings are reliable. First, we address the potential endogeneity problem between bank CEO confidence and risky mortgage approvals by adopting a number of methods, including instrumental variable (IV) estimation, additional fixed effects, a matched loan analysis at the application level, and a propensity score matching (PSM) approach. Second, we use alternative measures for CEO overconfidence and mortgage riskiness to reinforce our main findings. Third, we examine whether the effect of CEO overconfidence persists before and during the crisis.

5.1 An IV approach

In this subsection, we implement a two-stage IV analysis to address the potential concerns of reverse causality- that is, the possibility of a significant increase in a bank's loan approval prompts the choice of an overconfident CEO rather than vice versa. For our two-stage approach to be valid, the suggested instrumental variable must satisfy the exclusion restriction and be strongly correlated with CEO overconfidence. Following the spirit of Dong et al. (2021b), we use the geographic proximity of a focal bank to the local largest firm with an overconfident CEO (*Proximity*) within its community as an instrument for CEO overconfidence. Previous studies

argue that CEOs make similar decisions and tend toward a particular characteristic in the same community (Brown et al., 2008; Pool et al., 2015). In a similar vein, the geographic proximity between a focal bank and the largest firm with an overconfident CEO in the same community leads to a higher tendency for the CEO of the focal firm to make similar decisions and become overconfident. We define community at the city level, pinpoint the locations of the largest firms with overconfident CEOs, and apply Vincenty's formula[18] to calculate the geographic proximity between a BHC and its local largest firm with an overconfident CEO. We expect *Proximity* to have a positive relationship with CEO overconfidence. However, there is no theoretical rationale that links *Proximity* to the residuals associated with risky loan origination. We also control for bank characteristics in both stages of the two-stage regression to mitigate the concern that bank characteristics might be correlated with both *Proximity* and *Loan approval*.

Table 7 reports the 2SLS regression results. Column (1) presents the first-stage regression result. The positive and significant coefficient of *Proximity* supports the notion that bank CEOs located near their local largest firms with overconfident CEOs are more likely to be overconfident. In the second stage, the coefficient on the instrumented $\widehat{Holder67} \times LTI$ is positive and significant at the 5% level, which further supports *H1*. To mitigate concern regarding the potential issue of a weak instrumental variable, we conduct the Cragg–Donald chi-squared test. The corresponding F-statistic exceeds the critical value of 10 suggested by Stock and Yogo (2005) for assessing the strength of the instrumental variable.

[18] According to the Vincenty's formula, geographic distance between two latitude and longitude coordinates (a1, b1) and (a2, b2) is calculated as follows:

$$Distance = 3963.19 \times arctan \frac{\sqrt{(cosa_2 \sin(b_2-b_1))^2+(cosa_1 sina_2 - sina_1 cosa_2 \cos(b_2-b_1))^2}}{sina_1 sina_2 + cosa_1 cosa_2 cos(b_2-b_1)}.$$

We then multiple the distance by negative one to get *Proximity*.

To ensure that the results of our study are due to CEO overconfidence and not other factors, such as risk attitudes, we use two instrumental variables in our falsification tests. The first instrumental variable, Proximity (Non-OC), measures the geographic proximity between a focal bank and the largest firm with a non-overconfident CEO in the community. The second instrumental variable, Proximity (Risk seeking), measures the geographic proximity between a focal bank and the largest firm with a risk-seeking CEO in the community.

The results of our falsification tests are presented in Appendix B. The coefficients of Proximity (Non-OC) and Proximity (Risk seeking) are insignificant, suggesting that our findings are not due to other factors. Overall, the results imply that banks with overconfident CEOs are more likely to approve risky mortgages.

[Insert Table 7 about here]

5.2 Unobservable loan demand and supply factors

Given that some unobservable demand-side factors of mortgage lending could be highly correlated with CEO overconfidence and affect risky mortgage loan approvals, we follow Chu et al. (2020) by adding MSA × Year-fixed effects in our main regression to capture the time-varying factors at the MSA level. With MSA × Year-fixed effects, the coefficient on the interaction term between CEO overconfidence and the loan-to-income ratio captures the effect of CEO overconfidence on risky mortgage loan approvals within the same metropolitan statistical area during the same year. The MSA × Year-fixed effects indicate whether our results are driven by local factors. However, if CEO overconfidence is correlated with the within-MSA borrower heterogeneity, our baseline results in Table 2 could still be biased. Therefore, we also interact MSA × Year-fixed effects with additional variables, such as borrower's gender and race, to further control for unobservable demand-side factors. In addition, bank CEO overconfidence may be

correlated with some unobservable supply-side factors, which might impact banks' risk-taking decisions. Therefore, we also include Bank × Year-fixed effects to control for bank characteristics that vary at the yearly frequency. With Bank × Year-fixed effects, the coefficient on $Holder67_{jt-1} \times LTI_{ijt}$ captures the effect of CEO overconfidence on risky mortgage approvals by the same banks during the same year. The Bank × Year-fixed effects can also alleviate the concern that our results are driven by bank-related characteristics.

Appendix C presents the results including the MSA × Year-fixed effects. Specifically, we adopt the MSA × Year-fixed effects to control for time-varying factors at the MSA level in Column (1), interact the gender-fixed effects with MSA × Year-fixed effects in Column (2), and race-fixed effects with the MSA × Year-fixed effects in Columns (3)–(6), respectively. Consistent with Table 2, the coefficients of $Holder67_{jt-1} \times LTI_{ijt}$ remain positive and statistically significant, suggesting that our results are robust after considering demand-side unobservable factors. In Column (7), we remove bank-level measures and add Bank × Year-fixed effects to control for bank-related characteristics. The coefficient of $Holder67_{jt-1} \times LTI_{ijt}$ remains positive and significant, indicating that our results are not affected by bank-level unobservable factors. Overall, the results suggest that the effects of CEO overconfidence on risky mortgage approvals are unlikely to be driven by demand- or supply-side unobservable factors.

5.3 Matched loan analysis

To mitigate the bias that arises from the different characteristics of borrowers within the same metropolitan statistical area (MSA), we use a matched loan analysis at the application level. Given that the mean of *Loan approval* reported in Table 1 is larger than 0.5, our matched sample starts with the denied mortgage loans. We matched each denied application with an approved loan that was made in the same year, state, and MSA. The matched loans also had to have the same

gender, race, and ethnicity for the applicant and co-applicant. The difference in the loan amount and applicant income between the matched loans had to be less than 5%. After removing the unmatched loans, we obtained a matched sample of 291,078 observations. We re-estimated Equation (1) using the matched sample.

The results presented in Appendix D show that the coefficients of $Holder67_{jt-1} \times LTI_{ijt}$ are positive and significant at the 1 percent level for the matched sample, confirming that our baseline results are not driven by the demand for mortgage loans.

5.4 Propensity score matching analysis

To reduce the potential bias that risky mortgage applicants are more likely to select banks with overconfident CEOs, we perform a PSM analysis without replacement. To calculate the propensity score, we estimate a Probit model to predict whether a mortgage loan is handled by banks with overconfident CEOs by controlling bank- and loan-level characteristics specified in Equation (1). Mortgage loans originating from banks with overconfident CEO are matched with those from non-overconfident CEOs with similar bank- and loan-level characteristics, with a minimum absolute value of the difference in propensity scores.

Appendix E reports the results. Panel A presents the univariate results for the matched sample. The t-values are insignificant, suggesting there are no significant differences in characteristics between the loans originated by banks with overconfident CEOs and the matched sample. Panel B shows the OLS regression results using the matched sample. The coefficient of $Holder67_{jt-1} \times LTI_{ijt}$ remains positive and statistically significant, reinforcing our main findings that overconfident CEOs are more likely to approve risky mortgage applications.

5.5 Alternative measures for mortgage riskiness and CEO overconfidence

To further ensure the robustness of our results, we adopt *Risk*, a monotonic transformation of *LTI*, as an alternative measure of the riskiness of mortgage loans. Following Chu et al. (2020), *Risk* is a dummy variable that equals one if *LTI* is greater than 3, and 0 otherwise. Then we re-estimate our baseline regression by replacing *LTI* with *Risk*. The estimation results are presented in Columns (1) and (2) of Table 8. The coefficients of $Holder67_{jt-1} \times Risk_{ijt}$ remains positive and statistically significant, suggesting that our results to robust to this alternative measure of mortgage riskiness.

Our results are also robust to two alternative measures of CEO overconfidence. First, we follow Humphrey-Jenner et al. (2016) and identify a CEO to be overconfident if she postpones the exercise of vested options that are 100 percent in the money (*Holder100*). The results are reported in Columns (3) and (4) of Table 8. The coefficients of $Holder67_{jt-1} \times LTI_{ijt}$ are positive and statistically significant, suggesting that our results are robust. Second, we use *CEO prestigious award* as an alternative measure for CEO overconfidence (Malmendier and Tate, 2008).[19] Following Shi et al. (2017) and Lee et al. (2022), we identify CEO award winners as those who have received awards granted by famous media and press, such as *the Businessweek, Chief Executive, Electronic Business Magazine, Ernst and Young, Financial World, Forbes, Harvard Business Review, Industry Week, Morning Star, The Times, and Times-CNN*.[20] Specifically, the *CEO prestigious award* is a dummy variable that equals 1 if a bank's CEO has received any award from these places, and 0 otherwise. The results are presented in Columns (5) and (6). The coefficients of *CEO Prestigious Award* × *LTI* are significant and positive. Overall, the findings are robust to alternative measures of mortgage riskiness and CEO overconfidence.

[Insert Table 8 about here]

[19] We thank the associate editor for suggesting this.
[20] We thank Shi Wei for providing us with the CEO prestigious award data.

5.6 CEO overconfidence and bank-level loan performance

Since CEO overconfidence is measured at the firm-level, we further check how CEO overconfidence affects bank-level loan performance. Specifically, we test the impact of CEO overconfidence on the aggregate level of loan approvals and the ratio of non-performing loans to total assets.

Table 9 presents the results. The coefficients of $Holder67_{jt-1} \times LTI_{ijt}$ are significantly positive in Columns (1) and (2), suggesting banks with overconfident CEOs have higher loan approvals in aggregate. In addition, the results in Columns (3) and (4) indicate banks with overconfident CEO also have a higher percentage of non-performing loans. The positive effect of CEO overconfidence on bank-level loan approvals and non-performing loans confirms that the relaxation of lending standards by overconfident CEOs weakens loan quality and therefore overconfident banks experience more loan defaults (Ho et al., 2016). These results provide further support for the risk-taking channel of CEO overconfidence in risky mortgage approvals, and that our statistical significance in Equation (1) is not blown up by using loan-level regressions.

[Insert Table 9 about here]

5.7 The role of CEO overconfidence before and during the crisis

The Federal Reserve and the U.S. government have imposed intensified regulations after the financial crisis aiming to reduce excessive risk-taking after the financial crisis. However, there are many debates on whether these policies are effective. For example, Murdock (2010) suggests the *Financial Reform Act* does not adequately deal with the underlying issue that drives any financial crisis, and management incentives might lead to excessive risk-taking. In this section, we further compare the effect of CEO overconfidence before, and during the financial crisis, and

examine if the effect of CEO overconfidence on risky mortgage approvals is persistent in the different periods of the crisis.

Table 10 presents the results. We define the pre-crisis period as 2000-2006 and the crisis period as 2007-2009. In Panels A and B, the coefficients of $Holder67_{jt-1} \times LTI_{ijt}$ are significantly positive in Columns (1)-(4), confirming that overconfident CEOs are more likely to approve risky mortgages during both periods. However, the coefficients for $Holder67_{jt-1} \times LTI_{ijt}$ during and after the crisis are 0.24 and 0.27 (when all controls are included), respectively, which is about three times lower than the coefficient of 0.64 for the pre-crisis period. This suggests that although the impact of CEO overconfidence persists following the crisis, the improved bank regulations and intensified monitoring have significantly reduced its impact on risky mortgage lending.[21]

[Insert Table 10 about here]

6. Conclusions

Our paper examines the relationship between CEO overconfidence and banks' risky mortgage origination in the post-financial crisis period. We show that banks with overconfident CEOs are more likely to approve risky mortgage applications than their counterparties. Bank governance, technology adoption, and competition moderate the positive effect of CEO overconfidence on risky mortgage approvals. The channel analysis shows that overconfident CEOs increase banks' overall risk appetite, which in turn lead loan officers to approve more risky mortgage applications. Our results hold after a battery of robustness tests. Furthermore, the positive effect of CEO overconfidence decreased during and after the financial crisis of 2008. This is likely because the increased regulation of the financial industry made it more difficult for

[21] We thank an anonymous referee for the comment.

overconfident CEOs to take risks. Overall, our study suggests that both internal and external monitoring are necessary to prevent overconfident CEOs from taking excessive risks.

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Table 1. Summary statistics

Panel A presents summary statistics for variables used in the study. Our sample period is from 2010 to 2017. The final sample includes 1,582,219 mortgage loan applications which come from 601 bank holding company-year. Panel B presents the univariate comparisons of the loan-to-income ratio (*LTI*) of approved loans between banks with and without overconfident CEOs. Columns (1) and (2) report the mean and median of *LTI* in each group. The last column reports the mean and median differences in *LTI* between the two groups. The variables are defined in Appendix A. ***, **, and * stand for statistical significance at the 1%, 5%, and 10% levels, respectively. T- and Z-statistics are reported in parentheses. See Appendix A for variable definitions.

Panel A: Descriptive statistics

	Mean	S.D.	P25	P50	P75	Obs.
Loan Characteristics						
Loan approval	0.715	0.451	0	1	1	1,582,219
Loan-to-income Ratio (LTI)	2.888	7.430	1.792	2.610	3.563	1,582,219
Male	0.667	0.471	0	1	1	1,582,219
White	0.696	0.460	0	1	1	1,582,219
Black	0.049	0.216	0	0	0	1,582,219
Hispanic	0.080	0.271	0	0	0	1,582,219
Asian	0.126	0.332	0	0	0	1,582,219
Bank Characteristics						
Holder67	0.348	0.477	0	0	1	601
Size	16.874	1.766	15.678	16.414	17.805	601
Liquidity	0.054	0.046	0.025	0.040	0.072	601
Tier 1 capital	0.173	0.624	0.115	0.127	0.148	601
Charge-off	0.006	0.008	0.001	0.003	0.009	601
ROA	0.021	0.013	0.018	0.022	0.025	601
Deposits	0.726	0.149	0.701	0.766	0.817	601

Panel B: Univariate tests

	Overconfidence	Non-overconfidence	Difference
	N = 243,047	N = 207,169	
	(1)	(2)	(3)=(1) - (2)
Mean	2.754	2.671	0.083***
			(14.047)
Median	2.630	2.579	0.051***
			(26.511)

Table 2. CEO overconfidence and mortgage approvals

This table presents the ordinary least squares (OLS) regression results of the effects of CEO overconfidence on mortgage approvals. Our sample consists of mortgage loan level observations from 2010 to 2017. The dependent variable is *Loan approval*. The key independent variable is the interaction term between CEO overconfidence, measured by *Holder67*, and loan-to-income ratio, measured by *LTI*. Other variables are defined in Appendix A. BHC, MSA, and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1) *Loan approval*	(2) *Loan approval*	(3) *Loan approval*	(4) *Loan approval*
Holder67 × LTI	0.028**	0.027**	0.027**	0.027**
	(2.322)	(2.283)	(2.376)	(2.335)
Holder67	-0.055	0.024	-0.050	0.027
	(-0.980)	(0.661)	(-0.902)	(0.748)
LTI	-0.048***	-0.047***	-0.047***	-0.046***
	(-4.723)	(-4.683)	(-4.881)	(-4.835)
Size		-0.158***		-0.155***
		(-3.017)		(-3.028)
Liquidity		1.217		1.197
		(1.549)		(1.542)
Tier 1 capital		-0.010		-0.009
		(-0.343)		(-0.328)
Charge-off		5.638		5.693
		(1.444)		(1.483)
ROA		-0.997		-0.835
		(-0.644)		(-0.547)
Deposits		0.755*		0.723*
		(1.872)		(1.823)
Male			0.038***	0.037***
			(6.800)	(6.573)
White			0.026***	0.025***
			(2.753)	(2.764)
Black			-0.105***	-0.105***
			(-3.206)	(-3.246)
Hispanic			-0.134***	-0.131***
			(-7.249)	(-7.249)
Asian			-0.018*	-0.019**
			(-1.674)	(-2.025)
Intercept	0.623***	3.130***	0.599***	3.067***
	(11.481)	(2.919)	(9.731)	(2.900)
BHC FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	1,582,219	1,582,219	1,582,219	1,582,219
Adj-R^2	0.070	0.077	0.080	0.088

Table 3. The role of CEO power and corporate governance

This table examines the effect of CEO power and corporate governance on our main findings. Panel A presents the OLS regression results regarding the effects of CEO power on the relationship between CEO overconfidence and risky mortgage approvals. CEO power is measured by CEO tenure, CEO ownership, CEO duality, and CEO pay slice. Panel B presents the OLS regression results regarding the effects of corporate governance on the relationship between CEO overconfidence and risky mortgage approvals. We use board busyness and board independence as two proxies for corporate governance and divide the sample into high- and low- subsamples based on the sample medians. Our sample consists of mortgage loan level observations from 2010 to 2017. The dependent variable is *Loan approval*. The key independent variable is the interaction term between CEO overconfidence and loan-to-income ratio, *Holder67 × LTI*. Other variables are defined in Appendix A. BHC, MSA, and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A. The role of CEO power

	CEO tenure		*CEO ownership*		*CEO duality*		*CEO pay slice*	
	(1) High	(2) Low	(3) High	(4) Low	(5) Yes	(6) No	(7) High	(8) Low
Holder67 × LTI	0.126***	0.025**	0.076***	0.003	0.070*	0.009	0.095***	0.027
	(2.935)	(2.437)	(2.981)	(0.554)	(1.824)	(0.877)	(4.988)	(1.336)
Holder67	-0.051	-0.039	-0.083**	-0.018	-0(1.046	-0.085***	-0.053	-0.037
	(-1.294)	(-1.013)	(-2.080)	(-0.484)	(-0.854)	(-2.785)	(-1.248)	(-1.567)
LTI	-0.140***	-0.061***	-0.091***	-0.038***	-0.086**	-0.044***	-0.112***	-0.046**
	(-3.296)	(-6.570)	(-3.622)	(-9.148)	(-2.260)	(-5.263)	(-6.485)	(-2.387)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	477,768	486,866	779,604	797,811	641,892	940,327	398,014	447,295
Adj-R^2	0.101	0.085	0.089	0.063	0.099	0.057	0.055	0.138
The difference in coefficient test	11.12***		22.36***		5.37**		18.73***	

Panel B. The role of corporate governance

	Busy Board		*Board Independence*	
	(1) High	(2) Low	(3) Low	(4) High
Holder67 × LTI	0.061***	0.008	0.077***	0.011
	(3.994)	(1.283)	(3.975)	(1.186)
Holder67	0.199***	0.191***	0.187***	0.207*
	(6.208)	(4.284)	(3.289)	(1.818)
LTI	-0.055***	-0.026***	-0.152***	-0.035***
	(-3.100)	(-4.498)	(-3.177)	(-3.480)
Controls	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	198,395	267,109	391,521	416,347
Adj-R^2	0.091	0.073	0.080	0.075
The difference in coefficient test	31.89***		27.74***	

Table 4. The role of bank technology adoption

This table examines the effect of technology adoption on the relationship between CEO overconfidence and risky mortgage approval. We divide the sample into low- and high-subsamples based on median values of *interest rate volatility* (the standard deviation of interest rates) and *lending productivity* (number of loans per employee). Low-interest rate volatility and high lending productivity indicate high technology adoption. Our sample consists of mortgage loan level observations from 2010 to 2017. The dependent variable is *Loan approval*. The key independent variable is the interaction term of CEO overconfidence, measured by *Holder67*, and loan to income ratio, measured by *LTI*. Other variables are defined in Appendix A. BHC, MSA, and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the Bank level. *, **, and *** denote significance at 10%, 5%, and 1% level, respectively.

	Interest rate volatility		*Lending productivity*	
	(1) High	(2) Low	(3) Low	(4) High
Holder67 × *LTI*	0.128***	0.041**	0.103***	0.037**
	(8.351)	(2.107)	(4.894)	(2.280)
Holder67	0.183***	0.171**	0.131***	0.143**
	(2.907)	(2.441)	(2.760)	(2.594)
LTI	-0.152***	-0.061***	-0.044***	-0.056***
	(-11.113)	(-9.468)	(-5.008)	(-3.622)
Controls	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	839,981	742,238	633,558	948,661
Adj-R^2	0.097	0.096	0.067	0.142
The difference in coefficient test		4.12**		8.50***

Table 5. The role of bank competition

This table examines the effect of bank competition on the relationship between CEO overconfidence and risky mortgage approvals. Bank competition is measured by the number of bank branches, deposit *HHI*, and mortgage loan *HHI*. Our sample consists of mortgage loan level observations from 2010 to 2017. The dependent variable is *Loan approval*. The key independent variable is the interaction term between CEO overconfidence and loan-to-income ratio, *Holder67 × LTI*. Other variables are defined in Appendix A. BHC, MSA, and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	Number of banks		*Deposit HHI*		*Mortgage loan HHI*	
	(1) Low	(2) High	(3) High	(4) Low	(5) High	(6) Low
Holder67 × LTI	0.089***	0.005	0.048***	0.008	0.072***	0.014
	(5.877)	(0.336)	(4.345)	(0.019)	(4.402)	(1.189)
Holder67	-0.399	0.027	-0.226	0.005	-0.139	0.004
	(-1.206)	(0.992)	(-0.967)	(0.170)	(-0.833)	(0.151)
LTI	-0.111***	-0.032***	-0.061***	-0.033***	-0.094***	-0.030***
	(-11.198)	(-3.149)	(-6.442)	(-3.527)	(-7.756)	(-2.944)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	776,579	805,640	770,299	811,920	785,943	796,276
Adj-R^2	0.070	0.089	0.089	0.092	0.083	0.075
The difference in coefficient test	20.65***		11.40***		10.85***	

Table 6. CEO overconfidence and bank risk-taking

This table examines the effect of CEO overconfidence on bank risk-taking. Our sample consists of mortgage loan level observations from 2010 to 2017. The dependent variables in Columns (1)-(5) are different proxies for bank risk-taking levels. The key independent variable is CEO overconfidence, measured by *Holder67*. Other variables are defined in Appendix A. BHC and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the bank level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent variable=	*Equity return volatility*	*Earnings volatility*	*Cash flow volatility*	*Risk level*	*Downside risk rising*
	(1)	(2)	(3)	(4)	(5)
Holder67	0.004**	0.008**	0.009***	0.300***	0.013**
	(2.204)	(2.171)	(2.020)	(3.333)	(2.166)
Size	-0.006**	-0.008**	-0.011**	-0.137	-0.160
	(-2.460)	(-1.999)	(-2.386)	(-0.864)	(-0.915)
Liquidity	0.029	-0.020	0.007	1.231	0.762
	(0.462)	(-1.556)	(1.601)	(0.938)	(0.656)
Tier 1 capital	0.041*	0.013*	0.002**	0.573***	1.000***
	(1.821)	(1.896)	(2.420)	(2.861)	(3.001)
Charge-off	0.440	-0.069	-0.018	1.243	3.419
	(1.222)	(-0.528)	(-0.541)	(1.351)	(0.352)
ROA	-0.044	-0.021	-0.019	-6.530***	-1.749***
	(-0.256)	(-0.210)	(-0.810)	(-4.608)	(-3.411)
Deposits	-0.059*	-0.009*	-0.011**	0.176	0.015
	(-1.873)	(-1.823)	(-2.025)	(0.290)	(0.027)
Intercept	-0.068**	0.151**	0.008***	5.205*	2.759
	(-2.284)	(2.201)	(4.573)	(1.962)	(0.974)
BHC FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Obs	601	601	601	601	601
Adj-R^2	0.569	0.798	0.552	0.048	0.024

Table 7. CEO overconfidence and mortgage loan approval: an IV approach

The table presents the 2SLS regression results examining the causal effects of CEO overconfidence on mortgage loan approval. Our sample consists of mortgage loan level observations from 2010 to 2017. The instrumental variable is *Proximity*, which is the geographic proximity between a focal bank and the largest firm with an overconfident CEO in the community. The dependent variable in the first stage is CEO overconfidence, measured by *Holder67*, and in the second stage, it is *Loan approval*. Other independent variables are the same as our main regressions in Table 2. Other variables are the same as our main regressions in Table 2. BHC, MSA, and year-fixed effects are included. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent variable=	First stage (1) *Holder67*	Second stage (2) *Loan approval*
Proximity	0.085**	
	(2.330)	
$\widehat{Holder67} \times LTI$		0.022**
		(2.607)
$\widehat{Holder67}$		-0.954
		(-1.120)
LTI	0.015	-0.045***
	(0.171)	(-5.783)
Size	-0.042	-0.646***
	(-1.309)	(-2.733)
Liquidity	0.032	1.753**
	(0.808)	(2.615)
Tier 1 capital	-0.771	-8.776**
	(-1.470)	(-2.241)
Charge-off	1.307	19.684*
	(1.619)	(1.957)
ROA	-0.424	-5.652**
	(-1.045)	(-2.221)
Deposits	-0.088	0.051
	(-1.230)	(0.140)
Male	0.000	0.038***
	(0.429)	(6.357)
White	0.000	0.026**
	(1.190)	(2.625)
Black	0.000	-0.101***
	(1.154)	(-2.993)
Hispanic	0.000	-0.136***
	(0.751)	(-7.486)
Asian	0.000	-0.017
	(1.132)	(-1.655)
Intercept	1.476**	19.033**
	(2.011)	(2.563)
BHC FE	Yes	Yes
MSA FE	Yes	Yes
Year FE	Yes	Yes
Obs	1,120,840	1,120,840
Adj-R^2	0.399	0.105

Table 8. Robustness tests: Alternative measures

This table presents the OLS regression results by using alternative measures for mortgage riskiness in Columns (1)-(2), and for CEO overconfidence in Columns (3)-(6). *Risk* is a dummy variable that equals 1 if the mortgage's loan-to-income ratio is larger than 3, and 0 otherwise. *Holder100* is a dummy variable that equals 1 if a bank CEO postpones the exercise of vested options that are 100 percent in the money, and 0 otherwise. *CEO Prestigious Awards* is a dummy variable that equals 1 if a CEO wins a prestigious award, and 0 otherwise (Lee et al., 2022). Our sample consists of mortgage loan level observations from 2010 to 2017. The dependent variable is *Loan approval*. The key independent variable is the interaction term of CEO overconfidence measures and mortgage loan default risk. Other variables are defined in Appendix A. BHC, MSA, and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	An alternative measure for mortgage riskiness		Alternative measures for CEO overconfidence			
	(1)	(2)	(3)	(4)	(5)	(6)
Holder67 × Risk	0.053***	0.056***				
	(6.984)	(7.856)				
Holder67	-0.035	0.046				
	(-0.627)	(1.259)				
Holder100 × LTI			0.028**	0.027**		
			(2.350)	(2.314)		
Holder100			-0.055	0.024		
			(-0.980)	(0.661)		
CEO Prestigious Award × LTI					0.039**	0.031*
					(2.085)	(1.836)
CEO Prestigious Award					0.047	0.041
					(0.680)	(0.616)
LTI	-0.024***	-0.010	-0.048***	-0.047***	-0.033**	-0.032**
	(-3.870)	(-0.335)	(-4.794)	(-4.767)	(-2.330)	(-2.409)
Controls	No	Yes	No	Yes	No	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	1,582,219	1,582,219	1,582,219	1,582,219	1,582,219	1,582,219
Adj-R^2	0.071	0.079	0.081	0.089	0.077	0.103

Table 9. CEO overconfidence and mortgage loan approval rate: Bank level analysis

This table presents the results examining the effects of CEO overconfidence on mortgage loan approval rates. Our sample consists of BHC-year-level observations from 2010 to 2017. The dependent variables are the *Loan approval rate* in Columns (1) and (2) and NPL in Columns (3) and (4). The key independent variable is CEO overconfidence, measured by *Holder67*. Other variables are defined in Appendix A. BHC and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1) *Loan approval rate*	(2) *Loan approval rate*	(3) *NPL*	(4) *NPL*
Holder67	0.027**	0.037**	0.011**	0.014*
	(2.343)	(2.071)	(2.064)	(1.841)
Size		-0.062***		-0.064***
		(-2.986)		(-2.670)
Liquidity		0.246		-0.057
		(0.542)		(-0.093)
Tier 1 capital		-0.045		-0.049*
		(-0.522)		(-1.661)
Charge-off		-0.948		0.149
		(-0.396)		(1.491)
ROA		0.034**		-0.842**
		(2.019)		(-2.378)
Deposits		0.101**		-0.025
		(2.335)		(-0.320)
Intercept	0.690***	1.786*	0.050***	-0.005
	(25.503)	(1.694)	(12.780)	(-0.036)
BHC FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	601	601	601	601
Adj-R^2	0.567	0.618	0.771	0.817

Table 10. CEO overconfidence and risky mortgage approvals before and during the crisis
This table presents the results of the effects of CEO overconfidence on risky mortgage approvals before and during the financial crisis. Panels A and B show the results for the pre-crisis period (2000-2006), and for the crisis period (2007–2009), respectively. The dependent variable is *Loan approval*. The key independent variable is the interaction term of CEO overconfidence, measured by *Holder67*, and loan to income ratio, measured by *LTI*. Other variables are defined in Appendix A. Column (1) presents the results without controls, and Columns (2) and (3) control for the bank- and loan-level characteristics, respectively. Column (4) includes both the bank- and loan-level characteristics in the regression. For all regressions, BHC, MSA, and year-fixed effects are included. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: Before the crisis (2000-2006)

	(1) *Loan approval*	(2) *Loan approval*	(3) *Loan approval*	(4) *Loan approval*
Holder67 × LTI	0.066***	0.065***	0.065***	0.064***
	(5.507)	(5.652)	(5.625)	(5.781)
Holder67	-0.087	-0.052	-0.079	-0.047
	(-1.565)	(-1.173)	(-1.449)	(-1.061)
LTI	-0.081***	-0.080***	-0.080***	-0.079***
	(-10.561)	(-10.661)	(-10.907)	(-11.034)
Controls	No	Partially	Partially	Yes
BHC FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	1,284,678	1,284,678	1,284,678	1,284,678
Adj-R^2	0.070	0.078	0.081	0.089

Panel B: During the crisis (2007-2009)

	(1) *Loan approval*	(2) *Loan approval*	(3) *Loan approval*	(4) *Loan approval*
Holder67 × LTI	0.025**	0.025**	0.024**	0.024**
	(2.147)	(2.109)	(2.186)	(2.148)
Holder67	-0.044	-0.016	-0.038	-0.012
	(-0.778)	(-0.344)	(-0.679)	(-0.261)
LTI	-0.042***	-0.041***	-0.041***	-0.040***
	(-4.097)	(-4.058)	(-4.210)	(-4.166)
Controls	No	Partially	Partially	Yes
BHC FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	389,107	389,107	389,107	389,107
Adj-R^2	0.069	0.078	0.080	0.088

Appendix A. Variable description

Variable	Definition
Panel A. Bank Level Variables	
Holder67	A dummy variable that equals 1 if a CEO does not exercise an option that is at least 67 percent in the money at least twice during her tenure, and 0 otherwise.
Holder100	A dummy variable that equals 1 if a CEO does not exercise an option that is at least 100 percent in the money at least twice during her tenure, and 0 otherwise.
Size	The natural logarithm of bank total assets.
Liquidity	Bank liquid assets scaled by total assets.
Tier 1 capital	Bank tier 1 capital scaled by risk-weighted assets.
Charge-off	Bank total charge-off scaled by total assets.
ROA	Bank operating income scaled by total assets.
Deposits	Bank total deposits scaled by total assets.
CEO tenure	The number of years a CEO has served.
CEO ownership	Percentage of shares held by a CEO.
CEO duality	A dummy variable that equals 1 if a CEO is also the president and 0 otherwise.
CEO pay slice	A CEO's total compensation divided by the total compensation of the top five executives.
Busy Board	The average number of board seats held by directors.
Board Independence	The ratio of independent directors on the board.
Interest volatility	The standard deviation of interest rates.
Lending productivity	The number of loans per employee.
Equity return volatility	The volatility of monthly stock return over a four-year period.
Earnings volatility	The volatility of EBITDA over a four-year period.
Cash flow volatility	The volatility of operating cash flow over a four-year period.
Risk level	The number of six risk-related words ("risk", "risks", "risky", "uncertain", "uncertainty", and "uncertainties") in the annual report divided by the total number of words.
Downside risk rising	A dummy variable indicating whether the increase in the downside risk of a bank is higher than that of the median average of all banks.
CEO prestigious awards	A dummy variable that equals to 1 if the CEO wins a prestigious award, and 0 otherwise.
Proximity	Negative one multiplying the shortest straight-line geographic distance (in miles) between the headquarter of a BHC and the headquarter of the largest (based on total asset) company with an overconfident CEO within the same city.
Loan approval rate	The number of mortgage loan originations scaled by the number of mortgage loan applications.
NPL	Bank non-performing loan scaled by total assets.
Number of Banks	The number of bank branches in each county using the bank location data in FDIC.
Deposit HHI	The average annual deposit *HHI* (sum of squared bank market shares) from each county. Deposit data comes from the FDIC.
Mortgage loan HHI	The mortgage loan HHI from each county. Mortgage loan data comes from the HMDA.
Panel B. Loan Level Variables	
Loan approval	A dummy variable that equals 1 if the loan is approved, and 0 otherwise.
Loan-to-income ratio (LTI)	The loan-to-income ratio of the mortgage applicant.
Risk	A dummy variable that equals 1 if *LTI* is greater than 3, and 0 otherwise.
Male	A dummy variable that equals 1 if the applicant is male, and 0 otherwise.
White	A dummy variable that equals 1 if the applicant is white, and 0 otherwise.
Black	A dummy variable that equals 1 if the applicant is black, and 0 otherwise.
Hispanic	A dummy variable that equals 1 if the applicant is Hispanic, and 0 otherwise.
Asian	A dummy variable that equals 1 if the applicant is Asian, and 0 otherwise.

Appendix B. Falsification tests

This table presents two falsification test results. In column (1), we use an alternative instrumental variable, Proximity (Non-OC), which is the geographic proximity between a focal bank and the largest firm with a non-overconfident CEO in the community. Column (3) uses the instrumental variable, Proximity (Risk seeking), which is the geographic proximity between a focal bank and the largest firm with a risk-seeking CEO in the community. A risk-seeking CEO is a CEO whose risk level is higher than the average risk level of other CEOs in the same geographic area. Columns (2) and (4) present the second-stage results. Controls are the same as in Table 2. Other variables are defined in Appendix A. BHC and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the bank level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Dependent variable=	First stage (1) *Holder67*	Second stage (2) *Loan approval*	First stage (3) *Holder67*	Second stage (4) *Loan approval*
Proximity (Non-OC)	-0.041			
	(-1.231)			
Proximity (Risk seeking)			0.052	
			(1.520)	
$\widehat{Holder67}$ × *LTI*		0.010		0.419
		(0.803)		(1.113)
$\widehat{Holder67}$		-0.807		-0.664
		(-0.548)		(-0.262)
LTI	0.013	-0.119***	0.016	-0.192***
	(0.183)	(-4.024)	(0.249)	(3.912)
Controls	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	1,582,219	1,582,219	1,582,219	1,582,219
Adj-R^2	0.698	0.085	0.642	0.173

Appendix C. Robustness tests: controlling for unobservable loan demand and supply factors

This table presents the robustness results by including additional fixed effects. Our sample consists of mortgage loan level observations from 2010 to 2017. The dependent variable is *Loan approval*. The key independent variable is the interaction term between CEO overconfidence and loan-to-income ratio, *Holder67 × LTI*. Other variables are defined in Appendix A. BHC, MSA, and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Loan approval	*Loan approval*	*Loan approval*	*Loan approval*	*Loan approval*	*Loan approval*	*Loan approval*
Holder67 × LTI	0.024**	0.024**	0.024**	0.024**	0.024**	0.024**	0.009*
	(2.233)	(2.232)	(2.225)	(2.222)	(2.216)	(2.228)	(1.792)
Holder67	0.065	0.065	0.066	0.066	0.065	0.065	
	(1.483)	(1.483)	(1.499)	(1.499)	(1.492)	(1.476)	
LTI	-0.041***	-0.041***	-0.041***	-0.041***	-0.041***	-0.042***	-0.016**
	(-4.376)	(-4.364)	(-4.348)	(-4.332)	(-4.312)	(-4.356)	(-2.279)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes	No
MSA × Year FE	Yes	No	No	No	No	No	Yes
Male × MSA × Year FE	No	Yes	No	No	No	No	No
White × MSA × Year FE	No	No	Yes	No	No	No	No
Black × MSA × Year FE	No	No	No	Yes	No	No	No
Hispanic × MSA × Year FE	No	No	No	No	Yes	No	No
Asian × MSA × Year FE	No	No	No	No	No	Yes	No
BHC × Year FE	No	No	No	No	No	No	Yes
Obs	1,582,219	1,582,219	1,582,219	1,582,219	1,582,219	1,582,219	1,582,219
Adj-R^2	0.065	0.065	0.065	0.065	0.065	0.065	0.018

Appendix D. Robustness tests: Matched loan analysis

This table presents the OLS regression results using the matched sample at the mortgage loan level. Our sample consists of mortgage loan level observations from 2010 to 2017. The dependent variable is *Loan approval*. The key independent variable is the interaction term between CEO overconfidence and loan-to-income ratio, *Holder67* × *LTI*. Other variables are defined in Appendix A. BHC, MSA, and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

	(1) *Loan approval*	(2) *Loan approval*	(3) *Loan approval*	(4) *Loan approval*
Holder67 × *LTI*	0.022***	0.014***	0.023***	0.016***
	(2.989)	(3.155)	(3.006)	(3.206)
Holder67	-0.101	0.021	-0.101	0.018
	(-1.340)	(0.434)	(-1.314)	(0.348)
LTI	-0.013***	-0.009***	-0.010***	-0.007***
	(-3.507)	(-4.099)	(-2.873)	(-2.993)
Controls	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	291,078	291,078	291,078	291,078
Adj-R^2	0.068	0.080	0.077	0.088

Appendix E. Robustness tests: A PSM approach

This table presents the PSM results. Panel A presents the univariate analysis between loans originated by banks with overconfident CEOs and those originated by their counterparties. Panel B shows the OLS results using the propensity score matched sample. Banks are matched by all control variables. Our sample consists of mortgage loan level observations from 2010 to 2017. The dependent variable is *Loan approva*l. The key independent variable is the interaction term between CEO overconfidence and loan-to-income ratio, *Holder67 × LTI*. Other variables are defined in Appendix A. BHC, MSA, and year-fixed effects are included in all regressions. T-statistics are based on standard errors adjusted for heteroscedasticity and clustered at the BHC level. *, **, and *** denote significance at the 10%, 5%, and 1% level, respectively.

Panel A: Univariate analysis

	Holder67 = 1	*Holder67 = 0*		
	Mean	Mean	Difference	*t*-value
	N=299,168	N=299,168		
LTI	2.912	2.841	0.071	1.252
Size	19.848	19.197	0.650	0.830
Liquidity	0.058	0.068	-0.010	1.099
Tier 1 capital	0.119	0.131	-0.013	0.981
Charge-off	0.009	0.007	0.002	1.011
ROA	0.021	0.023	-0.002	0.782
Deposits	0.612	0.692	-0.080	0.672
Male	0.579	0.624	-0.045	1.131
White	0.607	0.671	-0.064	1.093
Black	0.090	0.062	0.028	0.861
Hispanic	0.117	0.100	0.016	0.704
Asian	0.138	0.123	0.015	0.708

Panel B: Regression analysis

	(1)	(2)	(3)	(4)
Holder67 × LTI	0.028**	0.028*	0.027**	0.027**
	(1.992)	(1.968)	(2.016)	(1.995)
Holder67	-0.020	0.009	-0.017	0.012
	(-0.441)	(0.243)	(-0.372)	(0.339)
LTI	-0.039***	-0.039***	-0.039***	-0.039***
	(-3.024)	(-2.991)	(-3.139)	(-3.108)
Controls	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	598,336	598,336	598,336	598,336
Adj-R^2	0.100	0.101	0.108	0.110

Author Statement

Dear Editors,

No conflict of interest exists in the submission of this manuscript, and the manuscript is approved by all authors for publication. I would like to declare on behalf of my co-authors that the work described is original which has not been published elsewhere.

We sincerely appreciate the opportunity to resubmit the enclosed manuscript entitled "Déjà Vu: CEO Overconfidence and Bank Mortgage Lending in the Post-Crisis period" to be considered for publication in *Journal of Behavioral and Experimental Finance*. We follow all suggestions and comments closely in the revision. Our responses are presented in the reply letter which address the reviewers' and your comments and suggestions (in italics). If you have any queries, please do not hesitate to contact me at wangqing@jxufe.edu.cn.

Yours sincerely,
Qing (Sophie) Wang