Female leadership and bank risk-taking: Evidence from the effects of real estate shocks on bank lending performance and default risk

Female Leadership and Bank Risk-Taking: Evidence from the Effects of Real Estate Shocks on Bank Lending Performance and Default Risk[☆]

Ajay Palvia[a,*], Emilia Vähämaa[b,**], Sami Vähämaa[c,***]

[a] *Office of the Comptroller of the Currency, U.S. Department of the Treasury*

[b] *Hanken School of Economics, Department of Finance and Economics*

[c] *University of Vaasa, School of Accounting and Finance*

March 12, 2020

Abstract

This paper examines whether banks with female Chief Executive Officers (CEOs) and chairpersons of the board are associated with better lending performance and lower default risk when faced with severe real estate price shocks. Using a large panel of U.S. commercial banks, we document that female-led banks with high real estate exposure are associated with lower loan charge-offs and lower non-accrual loans relative to similar male-led banks. Furthermore, our empirical findings indicate that female-led banks with high real estate exposure have lower default risk and are less likely to fail in the aftermath of real estate price shocks. However, we find no evidence of superior lending performance or reduced default risk for female-led banks which are not exposed to severe real estate price shocks through high levels of real estate lending.

JEL classification: G01, G21, G30, G32

Keywords: Female CEOs, chairwomen, lending performance, loan losses, default risk, bank failures, real estate shocks

---

[☆] We thank three anonymous referees, Allen Berger, Angelica Gonzalez, Thomas Kick, Hannes Koester, Lars Ohnemus, Vathunyoo Sila, Yanfei Sun, Gabrielle Wanzenried, and conference and seminar participants at the 53rd Annual Meeting of the Eastern Finance Association, 56th Annual Meeting of the Southern Finance Association, the 20th Annual European Conference of the Financial Management Association, the 23rd Annual Conference of the Multinational Finance Society, the 9th Annual Workshop of the Nordic Corporate Governance Network, Pablo de Olavide University, and the University of Vaasa for helpful comments and suggestions. We also thank Parviz Alizada for research assistance. E. and S. Vähämaa gratefully acknowledge the financial support of the Academy of Finland, the OP Group Research Foundation, the Finnish Savings Banks Research Foundation, and the Foundation for Economic Education. Part of this paper was written while E. Vähämaa and S. Vähämaa were visiting the Alliance Manchester Business School at the University of Manchester. The opinions expressed in this paper reflect the views of the authors only and do not reflect the views of the Office of the Comptroller of the Currency or the U.S. Department of the Treasury.

[*] *Address:* Office of the Comptroller of the Currency, 400 7th Street, SW, Washington, D.C 20219., USA; *Tel.* +1 202-649-5505 *E-mail address:* ajay.palvia@occ.treas.gov

[**] *Address:* Hanken School of Economics, Department of Finance and Economics, P.O. Box 287, FI-65101 Vaasa, Finland; *Tel.* +358 40 352 1758; *E-mail address:* emilia.vahamaa@hanken.fi

[***] *Address:* University of Vaasa, School of Accounting and Finance, P.O. Box 700, FI-65101 Vaasa, Finland; *Tel.* +358 29 449 8455; *E-mail address:* sami@uva.fi

1. Introduction

This paper studies the association between bank risk-taking and the gender of the bank's Chief Executive Officer (CEO) and chairperson of the board. Specifically, we examine whether female CEOs and board chairs constrain bank risk-taking by focusing on the effects of severe real estate price shocks on the bank's subsequent lending performance and default risk. The motivation for our analysis stems from the gender-based differences in risk preferences and tolerance of individuals which have been widely documented in the psychology and behavioral economics literature. Considerable evidence suggests that women are more cautious and risk averse than men in financial decisions (see e.g., Powell and Ansic, 1997; Jianakoplos and Bernasek, 1998; Sunden and Surette, 1998; Barber and Odean, 2001; Dwyer, Gilkeson and List, 2002; Eckell and Grossman, 2002; Agnew, Balduzzi and Sunden, 2003; Charness and Gneezy, 2012; Hibbert, Lawrence and Prakash, 2018; Brooks, Sangiorgi, Hillenbrand and Money, 2019). If these gender-based differences in individuals' risk preferences affect decision-making in a professional setting and are also reflected in corporate-level decisions and outcomes, we should observe that female-led banks are associated with more cautious business strategies and are less inclined to take excessive risks. Using data on U.S. commercial banks, we empirically examine whether female-led banks are associated with better lending performance and lower default risk in the aftermath of severe real estate price shocks that occurred during the global financial crisis of 2008–2009.

The general underlying premise in our study is that the personal preferences, attitudes, and values of individual top executives and directors influence corporate decisions and outcomes. This conjecture is supported by the upper echelons theory of Hambrick and Mason (1984) and a large body of empirical studies on the impact of individual CEOs, CFOs and board chairs on the business strategies, financial policies, and governance structures of their firms (e.g., Bertrand and Schoar, 2003; Malmendier, Tate and Yan, 2011; Arena and Braga-Alves, 2013; Graham, Harvey and Puri, 2013; Cline, Walkling and Yore, 2018).[1] Moreover, closely related to our analysis, several studies have recently examined the effects of female executives and directors on firm-level outcomes (see e.g., Krishnan and Parsons, 2008; Barua, Davidson, Rama and Thiruvadi, 2010; Huang and Kisgen, 2013; Baixauli-Soler, Belda-Ruiz and Sanchez-Marin, 2015; Francis, Hasan, Park and Wu, 2015; Faccio, Marchica and Mura, 2016; Perryman, Fernando and Tripathy, 2016; Sila, Gonzalez and Hagendorff, 2016; Conyon and He, 2017; Liu, 2018; Harris, Karl and Lawrence, 2019). In brief, the prior studies generally show that firms with female executives make less risky financing and investment decisions and are more conservative with respect to financial reporting. Hence, the existing empirical evidence suggests that the gender-based differences in risk tolerance persist in a professional setting and are reflected in corporate-level outcomes.[2]

In banking context, the potential implications of gender-based differences in risk preferences and tolerance have been previously examined in Bellucci, Borisov and Zazzaro (2010), Beck, Behr and Guettler (2014), Berger, Kick and Schaeck (2014), Palvia, Vähämaa and Vähämaa (2015), Adams and Ragunathan (2019), and Fan, Jiang, Zhang and Zhou (2019). Studies by Bellucci et al. (2010) and Beck et al. (2014) focus on the gender of bank loan officers. Bellucci et al. (2010) find that female loan officers are more risk averse than male officers and constrain credit availability to new borrowers. Beck at al. (2013) compare loan decisions made by

[1] Bertrand and Schoar (2003) provide a comprehensive discussion on why individual managers may matter for corporate decisions and outcomes.

[2] The alternative view is that women who pursue leadership positions are less risk-averse than other women (see e.g., Adams and Funk, 2012; Adams, 2016). Therefore, due to self-selection, gender-based differences in risk tolerance may disappear among top executives and directors.

female and male loan officers, and report that the loans screened and monitored by female officers have significantly lower default rates. Berger et al. (2014) investigate how gender diversity on the executive board affects the bank's portfolio risk, and document a positive association between the proportion of female board members and portfolio risk. Adams and Ragunathan (2019) find that female representation on the board of directors does not have any meaningful effect on bank risk-taking, while Fan et al. (2019) document that a critical mass of female directors may constrain bank earnings management. Finally, most directly related to the current study, Palvia et al. (2015) examine whether bank capital ratios and default risk are associated with the gender of the bank's CEO and board chair. Their findings indicate that female-led banks hold more conservative levels of equity capital and are less likely to fail after controlling for the bank's asset risk and other attributes. In this paper, we aim to contribute to the existing literature by examining whether banks with female CEOs and chairpersons of the board are associated with better lending performance and lower default risk in the aftermath of severe real estate price shocks.

Given the documented gender-based differences in risk preferences and tolerance, we hypothesize that banks with female CEOs and board chairs are less inclined to take excessive risks. The global financial crisis of 2008-2009 and the subsequent global recession have commonly been attributed to inordinate levels of risk-taking by financial institutions, especially in terms of real estate lending. However, excessive risk-taking in real estate lending is likely to lead to bad outcomes, such as reduced profits and higher loan charge-offs, only when banks face severe shocks. Therefore, the financial crisis and the concomitant bursting of housing prices provides an expedient setting as an exogenous shock to examine the riskiness of banks' loan portfolios. If female CEOs and board chairs are more cautious and constrain risk-taking, we should observe that female-led banks with a significant real estate lending exposure have better lending performance and have lower default risk in the aftermath of severe real estate price shocks.

We test the hypothesis that female CEOs and board chairs constrain bank risk-taking by using a sample of 6,971 U.S. commercial banks over the period 2007–2017. Consistent with our hypothesis, we find that banks with female CEOs and board chairs are associated with better lending performance and lower default risk in the aftermath of severe real estate price shocks. Specifically, our results indicate that female-led banks with high real estate exposure have lower loan charge-offs and lower non-accrual loans relative to similar male-led banks. Furthermore, we document that female-led banks with high levels of real estate lending have higher Z-scores and are less likely to fail after being exposed to real estate price shocks. Nevertheless, the constraining effect of female CEOs and chairwomen on default risk seems to be driven by banks with high real estate lending exposure. We find no evidence of better lending performance or reduced default risk for female-led banks which are not exposed to severe real estate price shocks through high levels of real estate lending. Collectively, our empirical findings provide additional evidence to suggest that the behavioral differences between women and men may have important implications for corporate decisions and outcomes in the banking industry.

Our primary contributions can be summarized as follows. First, this paper extends the prior literature on the effects of female leadership on firm risk (e.g., Huang and Kisgen, 2013; Baixauli-Soler et al., 2015; Faccio et al., 2016; Sila et al., 2016; Perryman et al., 2016) by focusing on risk-taking in the banking industry. Banks are fundamentally different from non-financial firms in terms of their business models, exposure to regulations and supervision, societal importance, and risk-taking opportunities and incentives. Banks are also more sensitive to financial shocks and crises than non-financial firms (e.g., Fahlenbrach, Prilmeir and Stulz, 2012). Therefore, we consider the banking industry to provide a propitious context for studying the implications of gender-based differences in risk tolerance on corporate outcomes.

Furthermore, our paper contributes to the small body of literature that has examined the influence of female executives and directors on bank risk-taking (Berger et al., 2014; Palvia et al., 2015, Adams and Ragunathan, 2019). Most closely related to our study, Palvia et al. (2015) investigate the effects of female CEOs and board chairs on capital ratios and bank failures. We extend the work of Palvia et al. (2015) by examining whether banks led by female CEOs and board chairs are associated with better lending performance and lower default risk in the aftermath of severe real estate price shocks.

The remainder of this paper is organized as follows. Section 2 outlines the theoretical motivation for hypothesizing a linkage between bank risk-taking and the gender of the bank's CEO and board chair. Section 3 describes the data and presents the empirical framework used in our analysis. Section 4 reports the empirical findings on the effects of female CEOs or chairwomen on bank risk-taking. Finally, the last section summarizes the findings and concludes the paper.

2. Hypothesis development

The underlying premise for hypothesizing a linkage between bank risk-taking and the gender of the bank's CEO and board chair builds on the upper echelons theory of Hambrick and Mason (1984). The upper echelons theory suggests that managerial decisions are based on the personalized interpretations of the strategic situations, and that these personalized constructions are a function of individuals' experiences, values, and preferences. Thus, the theory predicts that the firm's strategic decisions and policy choices are, at least, partially influenced by managerial preferences and characteristics. Consistent with the upper echelons theory, a growing body of empirical research supports the view that the characteristics and personal preferences of individual executives are reflected in firms' business strategies, financial policies, and other corporate outcomes (see e.g., Bertrand and Schoar, 2003; Malmendier et al., 2011; Graham et al., 2013; Huang and Kisgen, 2013; Baixauli-Soler et al., 2015; Palvia et al., 2015; Faccio et al., 2016; Perryman et al., 2016; Cline et al., 2018; Ahmed, Sihvonen and Vähämaa, 2019).

The motivation for why the gender of individual executives and directors may influence bank risk-taking stems from the gender differences in risk preferences and tolerance that have been extensively documented in the cognitive psychology and behavioral economics literature. In brief, the literature on gender-based behavioral differences demonstrates that women are more cautious and risk averse than men in rendering financial decisions (e.g., Barber and Odean, 2001; Dwyer et al., 2002; Charness and Gneezy, 2012; Hibbert et al., 2018; Brooks et al., 2019). If these gender-based differences in individuals' risk preferences affect decision-making in a professional setting and are also reflected in firm-level decisions and outcomes as suggested by the upper echelons, we should observe that female-led banks are associated with more cautious business strategies and lower levels of risk-taking. Thus, based on the upper echelons theory and the documented behavioral differences between women and men, we posit the following general hypothesis:

H1: Banks led by female Chief Executive Officers and/or chairwomen are associated with lower risk.

We examine the association between female leadership and bank risk-taking by focusing on the effects of severe real estate price shocks on the bank's subsequent lending performance and default risk. The motivation for focusing on real estate price shocks is the vast relative size of real estate loans in banks' loan portfolios and the central role of risky real estate lending in the development of the global financial crisis of 2008-2009. In general, the risks involved with real estate lending lead to bad outcomes, such as reduced profits and higher loan charge-offs, only when banks face severe shocks in real estate markets. During periods of increasing or stable real estate prices, banks are less prone to incur losses from risky real estate lending because borrowers can more easily refinance their loans or sell their housing assets. Hence, risk-taking in real estate lending may not lead to bad outcomes on a large scale during good times. However, in adverse market conditions and in the aftermath of severe real estate price shocks, excessive risk-taking is likely to materialize in subsequent poor asset performance and increased insolvency risk. Consequently, if female CEOs and chairwomen constrain bank risk-taking, we would expect that among banks exposed to severe real estate price shocks, those led by women would have better lending performance and lower default risk in the aftermath of these shocks. These arguments lead to the following hypothesis:

> H2: Banks led by female Chief Executive Officers and/or chairwomen are associated with better lending performance and lower default risk after being exposed to a systemic market shock.

The global financial crisis and the associated bursting of real estate prices can be considered as an exogenous shock to individual banks' asset risk, and therefore, the crisis period provides a convenient opportunity to examine the ex post riskiness of banks' loan portfolios. While the lending practices of banks in aggregate before the financial crisis played an important role in the development of the crisis, it can be argued that an individual bank cannot cause a systemic real estate price shock with its lending practices. Although the crisis witnessed a broad-based, sharp decline in the U.S. real estate prices, the magnitude of the price correction varied substantially by region. Furthermore, while most commercial banks had substantial amounts of real estate loans on their books, it can be argued that the negative consequences of declining real estate prices on subsequent bank performance were most aggravated for banks with the highest levels of exposure to real estate lending. We exploit the real estate price shocks and especially the geographic variation in the magnitude and timing of these shocks to empirically test the second hypothesis.

3. The empirical setup

3.1. Data

The data used in the empirical analysis consist of U.S. commercial banks. We collect data from three different sources. First, we collect the names of the banks' Chief Executive Officers and chairpersons of the boards from SNL Financial. Second, we obtain balance sheet and income statement data for individual banks from the bank call reports through the Federal Financial Institutions Examination Council (FFIEC). Third, we utilize data on regional housing prices (House Price Index, HPI) obtained from the Federal Housing Finance Agency (FHFA) to capture real estate price developments. As a consequence, the sample of U.S. banks used in our empirical analysis is an intersection of the available data from SNL Financial, FFIEC, and FHFA. After excluding banks with missing data, we obtain a sample of 6,971 individual commercial banks and an unbalanced panel of 54,312 bank-year observations for the period 2007–2017.

Similar to Palvia et al. (2015), we construct data on female CEOs and board chairs based on the names of the banks' Chief Executive Officers and chairpersons as reported in SNL Financial. At a given point in time, SNL Financial provides the names of the current CEOs and board chairs of commercial banks. However, because SNL Financial does not provide historical data on executive and director names from which panel data sets could be constructed, we have utilized historical snapshots of SNL Financial data as recorded at the end of June of each individual year included in our sample.[3] For each bank and each fiscal year, we manually determine the gender of the bank's CEO and chairperson of the board based on their first names. In the case of unisex names, we required that at least 80 percent of the name holders were of a particular gender in order to deduce the gender of a given CEO or board chair.[4] For equivocal first names, we performed an internet search to determine gender. The unclear cases that could not be gender assigned based on these searches were excluded from the sample.

3.2. The empirical framework

We empirically examine the association between female CEOs, chairwomen, and bank risk-taking by regressing four alternative measures of banks' lending performance and default risk on female CEO and board chair dummy variables, a real estate shock indicator variable, and a set of control variables. Specifically, we estimate alternative versions of the following panel regression specification:

$$\begin{aligned} Bank\ risk_{i,t} = {} & \alpha + \beta_1 Female_{i,t-1} + \beta_2 RE\ shock_{i,t-1} + \beta_3 Female \times RE\ shock_{i,t-1} \\ & + \beta_{4-16} \left(Bank\text{-}specific\ controls\right)_{i,t-1} + \beta_{17-18} \left(State\text{-}specific\ controls\right)_{i,t-1} \\ & + \omega \left(State\ fixed\text{-}effects\right)_{i,t} + \varphi \left(Year\ fixed\text{-}effects\right)_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{1}$$

where the dependent variable *Bank risk*$_{i,t}$ is one of our four alternative bank risk measures for bank *i* at time *t*: (i) *Non-accrual loans*, (ii) *Loan charge-offs*, (iii) *Z-score*, or (iv) *Bank failure*.

---

[3] These snapshots of SNL Financial data are available only from 2007 onwards.

[4] The unisex names were coded to females and males based on http://www.genderchecker.com and http://www.nameplayground.com. The latter website provides percentages for the popularity of a given name in the U.S. in both genders. For instance, 39.7 percent of individuals named Pat are males and 60.3 percent are females, and consequently, an internet search was performed to determine the gender of a specific CEO or board chair named Pat.

The first two dependent variables are related to banks' lending performance and the other two variables are more direct measures of default risk.[5] These alternative dependent variables have been extensively used in the prior literature to measure bank risk-taking (see e.g., Cole and White, 2012; Barankova and Palvia, 2014; Otero González et al., 2016; Berger et al., 2017; Balasubramnian, Palvia and Patro, 2019; Ben-David, Palvia and Stulz, 2019). *Non-accrual loans*$_{i,t}$ is calculated as the ratio of non-accruing loans to total loans, while *Loan charge-offs*$_{i,t}$ is the ratio of loan charge-offs to total loans. *Z-score*$_{i,t}$ is calculated as the sum of the bank's return on assets and the equity capital ratio divided by the standard deviation of the return on assets over the previous five years. The Z-score is a widely used proxy for bank stability with lower values indicating higher default risk of the bank. Finally, we use bank failures as an ex post measure of excessive risk-taking and define *Bank failure*$_{i,t}$ as a binary variable which equals one for banks that fail during year *t*. We identify failed banks based on the FDIC list of bank failures and assistance actions.

The independent variable of main interest in Equation (1) is *Female*$_{i,t}$, which is defined as one of the following alternative female dummies: (i) *Female CEO* equals one if the bank has a female CEO, (ii) *Female chair* equals one if the bank has a female chairperson of the board and, (iii) *Female CEO or chair* is equal to one if either the CEO or the chairperson of the board is a female.

RE shock in Equation (1) is a dummy variable for real estate shocks. We define real estate shock as a year-over-year decline of at least 20 percent in the housing price index (HPI) in the

[5] As documented by Barakova and Palvia (2014), our lending performance measures non-accrual loans and loan charge-offs are strongly linked to the three Basel II/III risk estimates (i.e., probability of default, loss given default, and exposure at default).

state in which the bank operates.[6] These real estate shocks can be considered as exogenous shocks to examine the ex post riskiness of managerial decisions of individual banks. Although the lending practices of banks in aggregate before the financial crisis played an important role in the development of the crisis and the concomitant bursting of housing prices, it can be argued that an individual bank cannot cause a state-wide real estate price shock with its lending practices, at least if the bank is not having a predominant market share in the state.[7] Thus, for an individual bank in a given state, real estate price shocks are conceivably exogenous. About 5 percent of bank-years in our sample experienced HPI declines of over 20 percent during the global financial crisis. For our analysis, the interaction term *Female* × *RE shock* is of primary interest. We expect the coefficients for the interaction terms to be negative in the regressions with *Non-accrual loans*, *Loan charge-offs*, and *Bank failure* as the dependent variables and positive in the *Z-score* regressions.

Following the prior literature on bank risk-taking (e.g., Berger et al., 2014; Palvia et al., 2015; Otero González et al., 2016; Ahmed et al., 2019; Ben-David et al., 2019; Climent et al., 2019; Iqbal and Vähämaa, 2019), we employ a number of control variables such as bank size, capital ratio, financial performance, growth, and asset and funding structure to account for the effects of institution-specific factors on bank risk. Specifically, the bank-specific control variables included in Equation (1) are defined as follows: (i) *Size* is measured as the logarithm of

---

[6] As a robustness check, we have used three alternative definitions of *RE shock*; HPI decline of at least 25 percent, HPI decline of at least 15 percent, and HPI decline of at least 10 percent. The estimation results using the HPI decline thresholds of 25 and 15 percent are similar to our main analysis with a threshold of 20 percent. When the less stringent HPI decline of 10 percent is used, the results are consistent with our main analysis when *Loan charge-offs* and *Bank failure* are used as the dependent variables, but we do not find any effect of female leadership on *Non-accrual loans* and *Z-score* with this definition of *RE shock*.

[7] In our additional tests discussed in Section 4.4., we exclude banks with a dominant market share from the analysis.

total assets, (ii) *Capital ratio* is calculated as the ratio of total equity capital to total assets, (iii) *Profitability* is proxied by the return on assets (ROA) calculated as the ratio of net income to total assets, (iv) *Loan growth* is the logarithm of loan growth, (v) *Residential RE loans* is the ratio of residential real estate loans to total loans, (vi) *Core deposits* is the core deposit ratio which is measured as all deposits less deposits in large time-deposit and large-brokered deposit accounts scaled by total deposits, (vii) *Liquidity* is measured as the ratio of cash balances to total assets, (viii) *Public* is a dummy variable for publicly traded banks, (ix) *Subchapter S* is assigned to one for closely held banks that are organized under the subchapter-S, (x) *MBHC* is a dummy variable for the banks that are affiliated with a multibank holding company, and (xi) CEO *duality* is a dummy variable which equals one for banks in which the CEO and Chair positions are held by the same individual. Following Palvia et al. (2015), we also control for state-specific macroeconomic effects and local market conditions by including the state unemployment rate (*Unemployment*) and the state per-capita income (*PCI*) as additional control variables in the regressions[8]. Finally, we control for potential time-specific heterogeneity with year fixed-effects and we also include state fixed-effects to account for state-specific unobservable factors that may influence bank risk.[9]

We lag all the independent variables in Equation (1) by one year in order to ensure that we are assessing the linkage between ex ante variables and ex post outcomes. The lagging of the independent variables should also mitigate endogeneity concerns arising from simultaneity

[8] The state-specific control variables in Equation (1) correspond to the state of the bank's headquarters location. A vast majority of the banks in our sample are privately-owned banks that operate in a single state.

[9] We are not using bank fixed-effects in our main regressions because the female dummy variables remain unchanged over time for most banks in our sample, thereby leading to almost perfect collinearity with bank fixed-effects. Nonetheless, despite the severe collinearity problems, we estimate regression specifications with bank fixed-effects in our additional tests discussed in Section 4.4.

problems. Throughout the alternative regression specifications, we use robust standard errors which are adjusted for heteroskedasticity and are clustered by bank.

In addition to estimating Equation (1) using the total sample of 54,312 bank-year observations, we also estimate the regressions by using a subsample of banks with a high level of real estate exposure. For this purpose, we classify banks with the ratio of real estate loans to total loans in excess of 90 percent as banks with a high real estate exposure.[10] The selected threshold of 90 percent is, of course, arbitrary, but this relatively high threshold was chosen because the effects of real estate shocks on lending performance and default risk are expected to be most aggravated for banks with the highest levels of exposure to real estate lending.[11] In these regressions based on a subsample of banks with a high real estate exposure, we account for potential selection bias by including the inverse Mills ratio as an additional explanatory variable. In the first-stage estimation, we use the average residential real estate lending share of banks in the state and the average real estate loan rate in the state as exogenous explanatory variables for the bank's propensity to have a high real estate exposure.

3.3. Descriptive statistics and correlations

Descriptive statistics for the three different female variables (*Female CEO*, *Female Chair*, and *Female CEO or chair*), for the four alternative dependent variables (*Non-accrual loans*, *Loan* c*harge-offs*, *Z-score*, and *Bank failure*), and for the control variables are reported in Table 1. It

---

[10] As noted e.g. by Peni, Smith and Vähämaa (2013), real estate loans are by far the largest loan category in the loan portfolios of large U.S. bank holding companies. In our sample, real estate loans, on average, account for approximately 70 percent of total loans.

[11] As a robustness check, we have used alternative real estate lending exposure thresholds of 85 and 95 percent. The estimation results of these regressions are consistent with our main analysis.

can be noted from Table 1 that our sample is severely unbalanced towards male-led banks and female-led banks comprise only a small portion of the observations; 5.9 percent of the banks in our sample have a female CEO, 5.8 percent of the banks have a female board chair, and 9.9 percent of the banks have either a female CEO or a female board chair.[12] This shows that women are severely underrepresented in the top positions of U.S. banks despite the accentuated attempts to promote gender equality in corporations.

(insert Table 1 about here)

Table 1 further shows that there is considerable dispersion in our sample with respect to banks' lending performance and default risk. The levels of non-accruing loans and loan charge-off ratios are relatively high with means of 1.03 and 0.09 percent, respectively. The mean of the logarithm of Z-score is 3.59 with the 5th percentile to 95th percentile range being 1.33 to 5.28, thereby reflecting considerable variation in banks' default risk. The sample contains 326 bank failures which corresponds to about 0.6 percent of the bank-year observation.[13]

Regarding the control variables, it can be noted from Table 1 that the banks in our sample are very heterogeneous in terms of size, funding and asset structure, growth, financial performance, and real estate exposure. The logarithm of total assets has a mean of 12.13 ($185 million) with the 5th percentile to 95th percentile range varying from 10.31 to 14.42. The banks are well-capitalized with a mean capital ratio of about 10.95 percent and, on average, have return on assets of about 0.72 percent. The average bank holds about 70 percent of its loan portfolio in residential real estate loans. However, the proportion of real estate lending exhibits substantial

[12] These very low percentages of female CEOs and board chairs in the banking industry are consistent with the previously documented underrepresentation of women among the top executives and directors in non-financial firms (see e.g., Krishnan and Park, 2005; Jurkus et al., 2011; Huang and Kisgen, 2013; Faccio et al., 2016).

[13] The gender and financial data cover years 2007-2017 and we use bank failures during years 2008-2018 in our tests.

variation with the 5th percentile to 95th percentile range varying from only 33 percent to 93 percent. In approximately 35 percent of our sample banks, the positions of the CEO and board chair are held by the same individual. Finally, the descriptive statistics indicate that less than 20 percent of the banks in our sample are publicly traded, about 37 percent are subchapter-S banks, and approximately 16 percent of the banks are affiliated with a multibank holding company.

(insert Table 2 about here)

Table 2 reports bivariate correlations between the variables used in our regressions. As can be noted from the table, the three female dummy variables are positively correlated with each other, and the correlations between the female dummies and our four alternative bank risk measures appear negligible. The female dummy variables are strongly positively correlated with *Capital ratio* and *Liquidity*, and negatively correlated with *Size* and *Growth*, indicating that female-led banks tend to be smaller and more conservative with respect to loan growth and the level of equity capital and cash holdings. As expected, the four bank risk measures are strongly correlated with each other. Specifically, *Non-accrual loans* is positively correlated with *Loan charge-offs* and *Bank failure*, and negatively correlated with *Z-score*. In general, the correlations between our independent variables are relatively low in magnitude, and only the correlation coefficient between *Unemployment* and *PCI* is above 0.5. Thus, we conclude that our regression estimates should not be influenced by multicollinearity problems.

4. Results

4.1. Univariate tests based on propensity score matching

We begin our empirical analysis by conducting *t*-tests for differences in our bank risk measures (*Non-accrual loans*, *Loan charge-offs*, and *Z-score*) between female-led and male-led banks. For this purpose, we utilize propensity score matching to build three matched-firm samples in which the female-led banks are matched with male-led banks that are statistically indistinguishable from the female-led banks in terms of the control variables. We utilize nearest neighbor matching and require that the maximum difference between the propensity score of each treatment bank and that of its matched control bank does not exceed 0.01.[14] The propensity score matching results in a matched sample of 6,388 observations of banks with female and male CEOs, a matched sample of 6,212 banks with female and male board chairs, and a sample of 10,624 observations in which banks with either a female CEO or a board chair are matched with otherwise similar banks in which both the CEO and the board chair are males. Because propensity score matching effectively eliminates observable differences between the banks in terms of the control variables, we should not observe any differences in *Non-accrual loans*, *Loan* c*harge-offs*, and *Z-score* between the matched samples unless these bank risk measures are affected by the gender of the bank's CEO and/or board chair. Thus, propensity score matching should account for any endogenous selection based on observable variables.

(insert Table 3 about here)

Table 3 reports the mean values of *Non-accrual loans*, *Loan charge-offs*, and *Z-score* for the propensity score matched samples and the results of two-tailed *t*-tests for the null hypothesis that there is no difference in the means between the matched-bank samples. In Panel A of Table 3, we report the means and the *t*-tests for the complete matched-bank samples, in Panel B for matched samples of banks affected by real estate shocks, and in Panel C for matched samples of

[14] The propensity score matching successfully matches female-led banks with male-led banks, and the differences in the control variables between the female-led and male-led banks males and females are substantially reduced and become statistically insignificant in most cases. For brevity, we do not report the estimates of the first-stage matching regressions.

banks which are exposed to real estate price shocks through high levels of real estate lending. The *t*-tests presented in Panel A indicate that the gender of the bank's CEO and board chair may be related to lending performance and default risk. In particular, banks with female CEOs seem to have a slightly higher percentage of non-accruing loans than male-led banks (p < 0.10), and banks with female CEOs or chairs have lower *Z-scores* (p < 0.10). The differences in mean *Loan charge-offs* are very small and statistically insignificant.

After constraining the propensity score matched samples to banks affected by real estate shocks, the differences in bank risk measures appear insignificant with the exception of banks led by chairwomen. The *t*-tests in Panel B indicate that banks with female chairs have lower amounts of *Non-accrual loans* and *Loan charge-offs* (p < 0.05) and higher *Z-score* (p < 0.01). In Panel C, the *t*-tests are performed for the subsample of banks with a high level of real estate lending that are exposed to real estate shocks. Among this subset of banks with a high real estate exposure, banks led by female CEOs or chairwomen have statistically significantly lower *Non-accrual loans* and *Loan charge-offs* as well as higher *Z-score*. As can be noted from Panel C of Table 3, the percentage of loan charge-offs is almost four-fold in male-led banks in comparison to female-led banks, and the Z-scores are substantially higher for female-led banks. Thus, the univariate tests suggest that female-led banks with a high real estate exposure are less risky.

4.2. Lending performance regressions

We first examine the association between bank risk-taking and the gender of the bank's CEO and board chair by regressing lending performance measures on female CEO and board chair dummy variables, a real estate shock indicator variable, and our control variables. Given that the main purpose of our analysis is to examine the impact of real estate shocks on the ex post riskiness of banks' loan portfolios, the coefficient for the interaction term *Female* × *RE shock* in Equation (1) is of primary interest. Table 4 reports the estimation results of alternative versions of Equation (1) with *Loan* c*harge-offs* as the dependent variable. Models 1-3 are based on the full sample of banks, while in Models 4-6 the sample is constrained to include only banks with a high level of real estate exposure (i.e., the ratio of real estate loans to total loans in excess of 90 percent). All the regressions reported in Table 4 include the same set of bank-specific and state-specific control variables as well as year and state fixed-effects to account for any systemic variation in lending performance over time and across states. The adjusted R^2s of the alternative regression specifications range from 45.7 percent to 50.0 percent.

(insert Table 4 about here)

The estimates in Table 4 indicate that female-led banks are not, in general, associated with lower loan charge-offs. Inconsistent with Hypothesis 1, the coefficient estimates for *Female CEO*, *Female Chair*, and *Female CEO or chair* are statistically insignificant in Models 1-3. Furthermore, the estimates of Models 1-3 provide weak support for Hypothesis 2 as only the coefficient for the interaction term *Female chair* × *RE shock* is negative and statistically significant ($p < 0.05$), and the coefficient estimates for the other two interaction terms appear statistically insignificant. Consistent with Hypothesis 2, the negative and significant coefficient for *Female chair* × *RE shock* suggests that banks with female board chairs are associated with lower loan charge-offs when exposed to severe real estate price shocks.

When we constrain the sample to include only banks with high levels of real estate lending in Models 4-6, the coefficients for the three alternative interaction terms *Female* × *RE shock* are negative and statistically highly significant ($p < 0.01$). Thus, consistent with Hypothesis 2, the regressions indicate that female-led banks with high real estate lending exposure have lower loan charge-offs in the aftermath of real estate price shocks. The magnitudes of the estimated coefficients suggest that female CEOs and board chairs decrease loan charge-offs by approximately a basis point, which can be considered economically significant given the mean loan charge-off ratio of about 9 basis points in our sample. Overall, the estimates of Models 4-6 in Table 4 suggest that female leadership in banks may promote more conservative and less risky lending decisions.

With respect to the control variables, it can be noted from Table 4 that the coefficient estimates for most of our control variables are highly significant throughout the alternative model specifications, demonstrating the importance of these variables as determinants of banks' lending performance. The coefficient estimates for the control variables indicate that the level of loan charge-offs is negatively associated with *Profitability*, *Loan growth*, *Liquidity*, *Residential RE loans*, and *Core deposits*, while being significantly positively related to *Non-accrual loans*, *Size*, *Public*, *Subchapter S*, *MBHC*, and *Unemployment*. Moreover, as expected, the coefficient for *RE shock* is positive and statistically significant at the 1 percent level.

The estimation results of six alternative versions of Equation (1) with *Non-accrual loans* as the dependent variable are reported in Table 5.[15] Similar to Table 4, Models 1-3 are the estimates based on the full sample and Models 4-6 present the estimates for the subsample of banks with high levels of real estate lending. All specifications include the same set of bank-specific and state-specific control variables as well as year and state fixed-effects. As shown in Table 5, the adjusted R^2s of the regressions vary between 37.0 and 57.6 percent.

(insert Table 5 about here)

[15] For brevity, we do not tabulate the coefficient estimates for the control variables in Tables 5-7. The full regression results are available from the authors.

The coefficient estimates for the three female dummy variables are statistically insignificant in Models 1-3, suggesting that female-led banks which are not exposed to severe real estate price shocks are not associated with better lending performance. Similar to the loan charge-offs regressions reported in Table 4, the estimated coefficient for the interaction term *Female chair* × *RE shock* is negative and statistically significant ($p < 0.05$), while the coefficient estimates for the other two interaction terms are insignificant. Consistent with the charge-offs regressions, the coefficients for the three alternative interaction terms *Female* × *RE shock* are negative and statistically significant in Models 4-6 when the sample is constrained to banks exposed to real estate price shocks through high levels of real estate lending. The coefficient estimates indicate that female-led banks are associated with about 60 to 80 basis points lower non-accruing loans to total loans ratios. This corresponds to approximately one-half standard deviation decrease in non-accrual loans which can be considered as a substantial economic effect.

Overall, the regression results in Tables 4 and 5 suggest that female-led banks are not generally associated with better lending performance. Thus, we do not find support for Hypothesis 1. However, consistent with Hypothesis 2, the regressions provide strong evidence that female-led banks with a high real estate exposure have lower loan charge-offs and lower non-accrual loans in the aftermath of severe real estate price shocks.

4.3. Default risk regressions

We next test our research hypotheses by examining the association between bank default risk and the gender of the CEOs and board chairs. For this purpose, we first regress bank Z-scores on female CEO and board chair dummy variables, a real estate shock indicator variable, and our bank-specific and state-specific control variables. The Z-score is a widely used measure of a bank's default risk with lower values indicating a higher likelihood of financial distress. Again, our primary interest in these regressions is the coefficient for the interaction term *Female* × *RE shock*. Table 6 reports the estimates of six alternative versions of Equation (1) with *Z-score* as the dependent variable. As can be noted from the table, the adjusted R^2s of the alternative Z-score regressions range from about 35 percent to 38 percent.

(insert Table 6 about here)

In Models 1-3 which are based on the full sample of banks, the coefficients for the alternative female dummies are insignificant. The coefficient estimate for the interaction term *Female chair* × *RE shock* is positive and statistically highly significant ($p < 0.01$) in Model 2, whereas the coefficients for the other two interaction variables in Models 1 and 3 appear insignificant. Thus, with the exception of Model 2, the Z-score regressions based on the full sample do not provide support for the hypothesis that female CEOs and board chairs would constrain bank risk-taking.

When the sample is constrained to banks exposed to real estate price shocks through high levels of real estate lending in Models 4-6, the coefficients for the three alternative interaction terms *Female* × *RE shock* are positive and statistically significant. These positive coefficients indicate that female-led banks with high levels of real estate lending are associated with a substantially lower default risk after being exposed to severe real estate price shocks. The magnitudes of the coefficient estimates suggest that the differences in default risk are economically significant; the Z-scores of female-led banks exposed to severe real estate price shocks are about 70 to 80 percent higher than in similar male-led banks.

In addition to Z-scores, we use bank failures as an ex post measure of default risk and excessive risk-taking. Specifically, following Palvia et al. (2015), we estimate several alternative logistic regressions with *Bank failure* as the dependent variable. In addition to the bank-specific and state-specific control variables used in Equation (1), we also control for *Loan charge-offs* and *Non-accrual loans* in the bank failure prediction regressions. The estimates of six alternative regression specifications are presented in Table 7. Once again, we report the estimates based on the full sample of banks in Models 1-3 and the estimates based on the subsample of banks with high levels of real estate lending in Models 4-6.

(insert Table 7 about here)

The estimates in Table 7 indicate that female-led banks are less likely to fail, as the coefficients for *Female CEO* and *Female CEO or chair* are negative and statistically significant in Models 1 and 3. This finding is consistent with Palvia et al. (2015). Our primary interest is again in the coefficients for the interaction terms between the three alternative female dummy variables and *RE shock*. As can be noted from Table 7, the coefficient estimates for *Female chair* × *RE shock* and *Female CEO or chair* × *RE shock* are negative and statistically highly significant ($p < 0.01$) in Models 2 and 3, suggesting that female-led banks are less likely to fail after being exposed to severe real estate price shocks. Furthermore, when we constrain the sample in Models 4-6 to include only banks with high levels of real estate lending, the coefficients for all three alternative interaction terms *Female* × *RE shock* are negative and statistically highly significant ($p < 0.01$). Thus, the failure prediction regressions provide support for Hypothesis 1 as well as for Hypothesis 2.

Regarding the control variables (not tabulated), our estimates indicate that the likelihood of bank failure is significantly negatively associated with *Capital ratio*, *Profitability*, *Liquidity*, and *Core deposits*, while being positively associated with *Size*, *Non-accrual loans*, *Subchapter S*, and

RE shock. These findings are broadly consistent with the prior literature on bank failures (see e.g., Aubuchon and Wheelock, 2010; Cole and White, 2012; Palvia et al., 2015).

4.4. Additional tests

We acknowledge that our empirical analysis is subject to endogeneity concerns. Nonetheless, it can be argued that endogeneity should be of a lesser concern for our study than for the prior studies that examine how female executives influence capital ratios or other managerial choice variables (e.g., Palvia et al., 2015; Faccio et al., 2016) because our primary objective is to identify the effects of real estate shocks on the bank's subsequent lending performance and default risk. Real estate price shocks can be considered as exogenous shocks to examine the ex post riskiness of managerial decisions of individual banks. Although the lending practices of banks in aggregate before the financial crisis played an important role in the development of the crisis and the bursting of real estate prices, systemic real estate price shocks are conceivably exogenous for an individual bank.

The argument that real estate price shocks are exogenous is particularly applicable to smaller banks that do not have a dominant market share in their operating area. Thus, as the first additional test, we re-estimate the regression using a subsample from which all banks that have a market share in excess of 10 percent in a given state are excluded.[16] The estimates of these additional regressions (not tabulated) are very similar to the results reported in Tables 4-7.[17] Most importantly, for banks with high levels of real estate lending, the coefficients for the three

---

[16] For the few banks that operate in multiple states, the market share is weighted by the bank's market in each state.

[17] For brevity, we do not tabulate the estimation results discussed in Section 4.4. Tabulated results are available from the authors.

alternative interaction terms *Female* × *RE shock* are negative and statistically significant in the regressions with *Non-accrual loans*, *Loan charge-offs*, and *Bank failure* as the alternative dependent variables, while being positive and significant in the *Z-score* regressions. Overall, these additional regressions demonstrate that female-led banks with high real estate exposure are associated with better lending performance and lower default risk relative to male-led banks.

We conduct three additional tests to further mitigate endogeneity concerns. First, following Huang and Kisgen (2013) and Palvia et al. (2015), we utilize two-stage instrumental variable regressions to examine whether bank risk-taking is affected by the gender of the bank's CEO and board chair.[18] Our instrument of choice for *Female CEO*, *Female chair*, and *Female CEO or chair* is the gender equality index constructed by Di Noia (2002) in the state of the bank's headquarters location. The state-level gender equality is positively correlated with the three alternative female variables, while it arguably should not have any conceptual relation to the riskiness of individual banks. A complication with our empirical setup is the interaction term *Female* × *RE shock* which also needs to be instrumented. We simply use the interaction of gender equality index interacted with a dummy for a state-level HPI decline of at least 20 percent as the second instrumental variable. As an alternative approach to using the gender equality index, we also use a dummy variable which equals one for states that are in the bottom quartile of the gender equality index as an alternative instrument for the female variables. The estimates of the two-stage instrumental variable regressions provide partial support for our main findings. Although the coefficients for the *Female* × *RE shock* interaction terms have the same signs and

[18] We do not use instrumental variable regressions to examine bank failures. In logistic failure prediction regressions future bank failures are predicted with variables that are currently observable. In this type of a failure prediction setup, there cannot be simultaneity issues, and reverse causality would essentially require that a failure at a future point in time causes the gender of the bank's CEO and board chair at present time.

are significant when the bottom quartile gender equality dummy is used as the instrument, the magnitudes of the estimated coefficients on the instrumented female variables are unreasonably large in comparison to the coefficients in our main regressions. This suggests that the instrumental variable estimates are likely to suffer from a weak-instrument problem, and therefore the estimates should be interpreted with caution.

Our next approach for mitigating endogeneity concerns is to use the Arellano and Bond (1991) generalized method of moments (GMM) estimation procedure. In this dynamic panel setup, we consider the state-level variables as pre-determined and all the other variables as potentially endogenous.[19] The GMM estimates of the dynamic panel models are broadly consistent with our main analysis. Specifically, the estimates indicate that female-led banks with high levels of real estate lending are associated with statistically significantly lower loan charge-offs and higher Z-scores when faced with real estate price shocks. Nevertheless, the Sargan test statistics of over-identifying restrictions in the estimated models are relatively high, suggesting that instruments used in the GMM estimation are not necessarily valid. Therefore, similar to our instrumental variable regressions, the GMM estimates should be approached cautiously.

Finally, in order to address potential endogeneity related to omitted variable bias, we estimate regressions with bank fixed-effects. Nonetheless, it is important to recognize that we are not using bank fixed-effects in our main regressions because the female dummy variables remain unchanged over time for most banks in our sample, thereby leading to almost perfect collinearity with bank fixed-effects. Although our additional regressions with bank fixed-effects are plagued by collinearity problems, the estimates provide weak support for the hypothesis that female-led

[19] Given that the Arellano and Bond (1991) procedure utilizes lagged levels of the dependent variable as regressors, *Bank failure* cannot be used as a dependent variable in these additional tests.

banks are less risky. For banks with high levels of real estate lending, the coefficient estimates for *Female chair* × *RE shock* and *Female CEO or chair* × *RE shock* are negative and highly significant in the regressions with *Loan* c*harge-offs* as the dependent variable, and the coefficients for *Female CEO* × *RE shock* and *Female CEO or chair* × *RE shock* are positive and significant in the regressions with Z-score as the dependent variable. Collectively, the bank fixed-effects regressions attest to the robustness of our main findings.

4.5. Limitations

We acknowledge several limitations in our empirical analysis that should be considered when interpreting our results. First, similar to most empirical corporate governance studies, our analysis is subject to endogeneity concerns. However, given that we are interested in identifying the effects of real estate shocks on the bank's subsequent lending performance and default risk, endogeneity should be of a lesser concern for our study than for most prior studies that examine how female leadership influences specific corporate policies. In our analysis, we use lagged independent variables to mitigate endogeneity concerns arising from simultaneity problems and we utilize propensity score matching to account for any endogenous selection based on observable bank characteristics. We also use instrumental variable regressions and dynamic panel models to mitigate endogeneity concerns. Nonetheless, given that we are unable to fully rule out endogeneity, causal interpretations of our findings should be made cautiously.

In our empirical analysis, we have controlled for a number of bank-specific characteristics that are known to affect bank risk. However, due to data unavailability, we are unable to control for the banks' corporate governance attributes such as board composition, ownership structure, and managerial compensation incentives in our regressions. Previous studies have documented strong linkages between corporate governance attributes and bank risk-taking using data on large, publicly listed banks. Given that our sample mostly comprises smaller, privately-held banks, detailed data on governance characteristics, ownership structure, and executive compensation is unfortunately not available. In our regressions, we have attempted to control for differences in ownership and governance structures by including indicator variables for publicly traded banks, closely-held banks, and multibank holding companies.

Furthermore, it should be noted that we only focus on the gender of bank CEOs and board chairs and completely ignore all other personal attributes such as age, education, and experience that may affect the risk preferences and tolerance of individuals. Previous studies have documented that firms with older and more experienced executives are associated with lower levels of financial leverage and risk-taking. Thus, if our female dummies are positively correlated with age and experience, our results could be at least partially explained by omitted age and experience variables. Due to data unavailability, we are unable to control for the potentially confounding effects of other personal attributes in our analysis. To alleviate potential biases related to omitted variables, we include bank fixed-effects in our additional test to control for time-invariant omitted variables and unobserved heterogeneity. Nevertheless, when interpreting our findings, it is worth noting that the presence of a female CEO or board chair is most likely correlated with some omitted variables that also affect bank lending performance and default risk. Finally, we acknowledge that our sample of U.S. commercial banks is severely unbalanced towards male-led banks and female-led banks comprise only about 5 percent of the observations. This low proportion of banks with female CEOs and board chairs may create a bias in our estimations, especially when the sample is further constrained to include only banks with a high real estate lending exposure. It is also important to recognize that female CEOs and board chairs are more common in smaller, privately-held banks which may have different business strategies and face less stringent regulatory oversight relative to large banks.

5. Conclusions

In this paper, we examine the association between bank risk-taking and the gender of the bank's Chief Executive Officer (CEO) and chairperson of the board. Specifically, we examine whether female CEOs and board chairs constrain bank risk-taking by focusing on the effects of severe real estate price shocks on the bank's subsequent lending performance and default risk. The global financial crisis of 2008-2009 has commonly been attributed to inordinate levels of risk-taking by financial institutions, especially in terms of real estate lending. Thus, the financial crisis and the concomitant bursting of real estate prices provide an expedient setting as an exogenous shock to examine the ex post riskiness of banks' loan portfolios. We exploit the real estate price shocks and especially the geographic variation in the magnitude and timing of these shocks in our empirical analysis. Given the documented gender-based differences in risk tolerance, we hypothesize that female-led banks with real estate lending exposure are associated with better lending performance and lower default risk in the aftermath of severe real estate price shocks.

Using a sample of 6,971 U.S. commercial banks and 54,312 bank-year observations for the period 2007–2017, we find that banks with female CEOs and board chairs are associated with better lending performance and lower default risk in the aftermath of severe real estate price shocks. Specifically, our empirical findings indicate that female-led banks with high real estate exposure have lower loan charge-offs and lower non-accrual loans relative to similar male-led banks. Furthermore, we document that female-led banks with high levels of real estate lending have higher Z-scores and are less likely to fail after being exposed to real estate price shocks.

Consistent with Palvia et al. (2015), our results suggest that female leadership may reduce the likelihood of bank failure, while we find no evidence of better lending performance for female-led banks which are not exposed to severe real estate price shocks through high levels of real estate lending. Thus, we conclude that the constraining effect of female CEOs and chairwomen on bank risk is largely driven by banks with high real estate exposure.

Collectively, the results reported in this paper provide additional empirical evidence to suggest that female leadership may lead to less risky corporate outcomes. We believe that our results offer several important implications. Most importantly, our findings suggest that the advancement of women in the banking industry may be consistent with the interests of shareholders, depositors, bank supervisors and regulators, and other stakeholders. Given the substantial direct and indirect costs of bank failures to depositors, shareholders, debt holders, and the society in general, the documented linkage between female leadership and bank risk-taking may provide important insights for bank monitoring. From a public policy perspective, our results may be of interest to regulators when setting future policies for promoting gender equality and the advancement of women in the financial industry.

References

Adams, R., 2016. Women on boards: The superheroes of tomorrow? *The Leadership Quarterly*, Vol. 27, pp. 371–386.

Adams, R., & P. Funk, 2012. Beyond the glass ceiling: Does gender matter? *Management Science*, Vol. 58, pp. 219–235.

Adams, R. & V. Ragunathan, 2019. Lehman Sisters. Working paper, University of Oxford.

Agnew, J., P. Balduzzi & A. Sunden, 2003. Portfolio choice and trading in a large 401(k) plan. *American Economic Review,* Vol. 93, pp. 193–215.

Ahmed, S., J. Sihvonen & S. Vähämaa, 2019. CEO facial masculinity and bank risk-taking. *Personality and Individual Differences*, Vol. 138, pp. 133–139.

Arellano, M. & S. Bond, 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, Vol. 58 (2), pp. 277–297.

Arena, M. & M. Braga-Alves, 2013. The discretionary effect of CEOs and board chairs on corporate governance structures. *Journal of Empirical Finance*, Vol. 21, pp. 121–131.

Aubuchon, C. & D. Wheelock, 2010. The geographic distribution and characteristics of U.S. bank failures, 2007-2010: Do bank failures still reflect local economic conditions? *Federal Reserve Bank of St. Louis Review*, No. 92/5, 395–415.

Baixauli-Soler J.S., M. Belda-Ruiz & G. Sanchez-Marin, 2015. Executive stock options, gender diversity in the top management team, and firm risk taking. *Journal of Business Research*, Vol. 68, pp. 451–463.

Balasubramnian, B., A. Palvia & D. Patro, 2019. Can the book-to-market ratio signal banks' earnings and default risk? Evidence around the great recession. *Journal of Financial Services Research*, Vol. 56, pp. 119–143.

Barakova, I. & A. Palvia, 2014. Do banks' internal Basel risk estimates reflect risk? *Journal of Financial Stability*, Vol. 13, pp. 167–179.

Barber, B. & T. Odean, 2001. Boys will be boys: gender, overconfidence, and common stock investment. *Quarterly Journal of Economics*, Vol 116, pp. 261–292.

Barua, A., L. Davidson, D. Rama & S. Thiruvadi, 2010. CFO gender and accruals quality. *Accounting Horizons*, Vol. 24, pp. 25–39.

Beck, T., P. Behr & A. Guettler, 2013. Gender and banking: Are women better loan officers? *Review of Finance*, Vol. 17, pp. 1279–1321.

Bellucci, A., A. Borisov & A. Zazzaro, 2010. Does gender matter in bank-firm relationships? Evidence from small business lending. *Journal of Banking & Finance*, Vol. 34, pp. 2968–2984.

Ben-David, I., A. Palvia & R. Stulz, 2019. Do distressed banks really gamble for resurrection? *NBER Working Paper Series*, No. w25794.

Berger A., T. Kick & K. Schaeck, 2014. Executive board composition and bank risk taking. *Journal of Corporate Finance*, Vol. 28, pp. 48–65.

Berger, A., S. El Ghoul, O. Guedhami & R. Roman, 2017. Internationalization and bank risk. *Management Science*, Vol. 63, pp. 2283–2301.

Bertrand, M. & A. Schoar, 2003. Managing with style: The effect of managers on firm policies. *Quarterly Journal of Economics*, Vol. 118, pp. 1169–1208.

Brooks, C., I. Sangiorgi, C. Hillenbrand & K. Money, 2019. Experience wears the trousers: Exploring gender and attitude to financial risk. *Journal of Economic Behavior and Organization*, Vol. 163, pp. 483–515.

Charness G. & U. Gneezy, 2012. Strong evidence for gender differences in risk taking. *Journal of Economic Behavior & Organization*, Vol. 83, pp. 50–58.

Climent, F., A. Momparler & P. Carmona, 2019. Anticipating bank distress in the Eurozone: An extreme gradient boosting approach. *Journal of Business Research*, Vol. 101, pp. 885–896.

Cline, B., R. Walkling & A. Yore, 2018. The consequences of managerial indiscretions: Sex, lies, and firm value. *Journal of Financial Economics*, Vol. 127, pp. 389–415.

Cole, R. & L. White, 2012. Déjà vu all over again: The causes of U.S. commercial bank failures this time around. *Journal of Financial Services Research*, Vol. 45, pp. 5–29.

Conyon, M. & L. He, 2017. Firm performance and boardroom gender diversity: A quantile regression approach. *Journal of Business Research*, Vol. 79, pp. 198–211

Eckel, C. & P. Grossman, 2002. Sex differences and statistical stereotyping in attitudes toward financial risk. *Evolution and Human Behavior*, Vol. 23, pp. 281–295.

Dwyer, P., J. Gilkeson & J. List, 2002. Gender differences in revealed risk taking: Evidence from mutual fund investors. *Economics Letters*, Vol. 76, pp. 151–158.

Faccio, M., M-T. Marchica & R. Mura, 2016. CEO gender, corporate risk-taking, and the efficiency of capital allocation. *Journal of Corporate Finance*, Vol. 39, pp. 193–209.

Fahlenbrach, R., R. Prilmeier & R. Stulz, 2012. This time is the same: Using bank performance in 1998 to explain bank performance during the recent financial crisis. *Journal of Finance*, Vol. 67, pp. 2139–2185.

Fan, Y., Y. Jiang, X. Zhang & Y. Zhou, 2019. Women on boards and bank earnings management: From zero to hero. *Journal of Banking & Finance*, Vol. 107, 105607.

Fehr-Duda, H., M. de Gennaro & R. Schubert, 2006. Gender, financial risk, and probability weights. *Theory and Decision*, Vol. 60, pp. 283–313.

Francis, B., I. Hasan, J.C. Park & Q. Wu, 2015. Gender differences in financial reporting decision making: Evidence from accounting conservatism. *Contemporary Accounting Research*, Vol. 32, pp. 1285–1318.

García Lara, J.M., B. García Osma, A. Mora & M. Scapin, 2017. The monitoring role of female directors over accounting quality. *Journal of Corporate Finance*, Vol. 45, pp. 651–668.

Graham, J., C. Harvey & M. Puri, 2013. Managerial attitudes and corporate actions. *Journal of Financial Economics*, Vol. 109, pp. 103–121.

Hambrick, D.C. & P.A. Mason, 1984. Upper echelons: The organization as a reflection of its top managers. *Academy of Management Review*, Vol. 9, pp. 193–206.

Harris, O., J.B. Karl & E. Lawrence, 2019. CEO compensation and earnings management: Does gender really matters? *Journal of Business Research*, Vol. 98, 1–14.

Hibbert, A.M., E.R. Lawrence & A.J. Prakash, 2018. The effect of prior investment outcomes on future investment decisions: Is there a gender difference? *Review of Finance*, Vol. 22, pp. 1195–1212.

Huang, J. & D.J. Kisgen, 2013. Gender and corporate finance: Are male executives overconfident relative to female executives? *Journal of Financial Economics*, Vol. 108, pp. 822–839.

Iqbal, J. & S. Vähämaa, 2019. Managerial risk-taking incentives and the systemic risk of financial institutions. *Review of Quantitative Finance and Accounting*, Vol. 53, pp. 1229–1258.

Jianakoplos, N. & A. Bernasek, 1998. Are women more risk averse? *Economic Inquiry*, Vol. 36, pp. 620–630.

Jurkus, A., J.-C Park, & L. Woodard, 2011. Women in top management and agency costs. *Journal of Business Research* Vol. 64, pp. 180–186.

Krishnan, G. & L. Parsons, 2008. Getting to the bottom line: An exploration of gender and earnings quality. *Journal of Business Ethics*, Vol. 78, pp. 65–76.

Krishnan, H. & D. Park, 2005. A few good women – on top management teams. *Journal of Business Research*, Vol. 58, pp. 1712–1720.

Liu, C., 2018. Are women greener? Corporate gender diversity and environmental violations. *Journal of Corporate Finance*, Vol. 52, pp. 118–142.

Malmendier, U., G. Tate & J. Yan, 2011. Overconfidence and early-life experiences: The effect of managerial traits on corporate financial policies. *Journal of Finance*, Vol. 66, pp. 1687–1733.

Otero González, L., L.I. Rodríguez Gil, O. Martorell Cunill & J.M. Merigó Lindahl, 2016. The effect of financial innovation on European banks' risk. *Journal of Business Research*, Vol. 69, pp. 4781–4786.

Palvia, A., E. Vähämaa & S. Vähämaa, 2015. Are female CEOs and Chairwomen more conservative and risk averse? Evidence from the banking industry during the financial crisis. *Journal of Business Ethics*, Vol. 131, pp. 577–594.

Peni, E., S. Smith & S. Vähämaa, 2013. Bank corporate governance and real estate lending during the financial crisis. *Journal of Real Estate Research*, Vol. 35, pp. 313–343.

Perryman, A., G. Fernando & A. Tripathy, 2016. Do gender differences persist? An examination of gender diversity on firm performance, risk, and executive compensation. *Journal of Business Research*, Vol. 69, pp. 579–586.

Powell, M. & D. Ansic, 1997. Gender differences in risk behaviour in financial decision making: An experimental analysis. *Journal of Economic Psychology*, Vol. 18, pp. 605–627.

Sila, V., A. Gonzalez & J. Hagendorff, 2016. Women on board: Does boardroom gender diversity affect firm risk? *Journal of Corporate Finance*, Vol. 36, pp. 26–53.

Sunden, A. & B. Surette, 1998. Gender differences in the allocation of assets in retirement savings plans. *American Economic Review*, Vol. 88, pp. 207–211.

Table 1. Descriptive statistics.

Variable	Mean	St. dev.	p5	p25	p50	p75	p95	No. of obs
Female variables:								
Female CEO	0.06	0.24	0	0	0	0	1	54,312
Female chair	0.06	0.23	0	0	0	0	1	54,312
Female CEO or chair	0.10	0.30	0	0	0	0	1	54,312
Dependent variables:								
Loan charge-offs (%)	0.09	0.14	0	0.01	0.04	0.10	0.39	54,312
Non-accrual loans (%)	1.03	1.42	0	0.12	0.52	1.32	4.07	54,312
Z-score	3.59	1.18	1.33	2.93	3.74	4.4	5.28	54,182
Bank failure (%)	0.60	0.08	0	0	0	0	0	54,312
Control variables:								
Size	12.13	1.33	10.31	11.28	11.98	12.77	14.42	54,312
Capital ratio (%)	10.95	4.05	7.20	8.87	10.19	12.03	16.87	54,312
Profitability (%)	0.72	1.12	-1.30	0.43	0.85	1.25	2.05	54,312
Loan growth (%)	6.00	16.10	-13.20	-2.10	4.00	10.60	29.90	54,312
Liquidity (%)	8.26	7.74	1.52	3.03	5.56	10.72	24.20	54,312
Residential RE loans (%)	70.00	19.00	33.00	59.00	73.00	83.00	93.00	54,312
Core deposits (%)	88.12	10.86	67.59	82.96	91.22	96.20	99.26	54,312
Subchapter S	0.37	0.48	0	0	0	1	1	54,312
MBHC	0.16	0.36	0	0	0	0	1	54,312
CEO duality	0.35	0.48	0	0	0	1	1	54,312
Public	0.19	0.39	0	0	0	0	1	54,312
Unemployment (%)	6.50	2.20	3.50	4.60	6.10	8.10	10.60	54,312
PCI	4.30	0.60	3.40	3.90	4.30	4.70	5.50	54,312

The table reports summary statistics for the sample of U.S. commercial banks. The female variables are defined as follows: *Female CEO* is a dummy variable which equals one for banks that have a female CEO, *Female chair* equals one if the bank's chairperson of the Board of Directors is a female, and *Female CEO or chair* is assigned to one if either the CEO or the board chair of the bank is a female. The dependent variables are defined as follows: *Loan charge-offs* is the ratio of loan charge-offs to total loans, *Non-accrual loans* is the ratio of non-accruing loans to total loans, *Z-score* is the logarithm of the sum of the bank's return on assets and the equity capital ratio divided by the standard deviation of the return on assets over the previous five years, and *Bank failure* is a binary variable equal to one for banks that fail within one year. The control variables are defined as follows: *Size* is the logarithm of total assets, *Capital ratio* is the ratio of total equity capital to total assets, *Profitability* is the ratio of net income to total assets, *Loan growth* is the logarithm of loan growth, *Liquidity* is measured as the ratio of cash balances to total assets, *Residential RE loans* is the ratio of residential real estate loans to total loans, *Core deposits* is the core deposits ratio measured as all deposits less deposits in large time-deposit and large-brokered deposit accounts scaled by total deposits, *CEO duality* is a dummy variable which equals one for banks in which the CEO and chair positions are held by the same individual, *Public* is a dummy variable for publicly traded banks, *Subchapter S* is assigned to one if a bank is organized under the subchapter-S, *MBHC* is a dummy variable for the banks that are affiliated with a multibank holding company, *Unemployment* is the state unemployment rate, and *PCI* is the state per-capita income.

Table 2. Correlations.

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1)	Female CEO																				
(2)	Female chair	0.27																			
(3)	Female CEO or chair	0.76	0.75																		
(4)	Loan charge-offs	0.00	0.00	0.00																	
(5)	Non-accrual loans	0.01	0.00	0.01	0.58																
(6)	Z-score	-0.01	-0.01	-0.01	-0.44	-0.42															
(7)	Bank failure	-0.01	-0.01	-0.01	0.10	0.14	-0.17														
(8)	Size	-0.04	-0.04	-0.05	0.14	0.08	0.12	0.03													
(9)	Capital ratio	0.02	0.01	0.02	-0.08	-0.11	0.15	-0.05	-0.11												
(10)	Profitability	-0.02	0.00	-0.01	-0.48	-0.46	0.43	-0.13	0.08	0.12											
(11)	Loan growth	-0.02	-0.03	-0.02	-0.25	-0.23	0.04	0.00	0.00	0.11	0.00										
(12)	Liquidity	0.04	0.01	0.03	-0.02	-0.02	-0.02	-0.03	-0.21	0.07	-0.08	-0.11									
(13)	Residential RE loans	0.01	-0.02	-0.01	0.03	0.22	-0.01	0.05	0.17	-0.14	-0.18	0.01	-0.13								
(14)	Core deposits	0.01	0.02	0.02	-0.14	-0.07	0.17	-0.07	-0.13	-0.07	0.07	-0.19	0.18	0.04							
(15)	Subchapter S	0.00	0.02	0.01	-0.09	-0.10	-0.06	-0.02	-0.20	-0.06	0.26	-0.07	0.04	-0.16	0.09						
(16)	MBHC	0.00	-0.01	0.00	0.02	-0.02	0.02	0.00	0.13	0.04	0.05	-0.01	-0.04	-0.06	-0.03	-0.06					
(17)	CEO duality	-0.05	-0.05	-0.14	-0.02	-0.04	-0.01	-0.01	-0.01	0.04	0.05	-0.03	0.06	-0.10	0.01	0.08	-0.01				
(18)	Public	-0.01	-0.02	-0.01	0.11	0.09	0.03	0.03	0.45	-0.01	-0.09	0.06	-0.10	0.14	-0.08	-0.35	0.12	-0.06			
(19)	RE shock	0.00	0.00	0.00	0.00	0.00	-0.10	0.10	0.02	0.04	-0.02	0.10	-0.10	0.04	-0.16	-0.04	0.02	-0.03	0.09		
(20)	Unemployment	-0.01	-0.02	-0.01	0.28	0.27	-0.27	0.08	0.05	0.00	-0.29	0.02	-0.11	0.22	-0.34	-0.16	0.01	-0.08	0.16	0.13	
(21)	PCI	0.01	-0.02	0.00	-0.16	-0.11	0.18	-0.04	0.09	0.00	0.07	0.02	0.14	-0.02	0.29	0.01	-0.04	0.02	0.12	-0.11	-0.48

The table reports pairwise correlations between the variables used in the regressions. The female variables are defined as follows: *Female CEO* is a dummy variable which equals one for banks that have a female CEO, *Female chair* equals one if the bank's chairperson of the Board of Directors is a female, and *Female CEO or chair* is assigned to one if either the CEO or the board chair of the bank is a female. The dependent variables are defined as follows: *Loan charge-offs* is the ratio of loan charge-offs to total loans, *Non-accrual loans* is the ratio of non-accruing loans to total loans, *Z-score* is calculated as the sum of the bank's return on assets and the equity capital ratio divided by the standard deviation of the return on assets over the previous five years, and *Bank failure* is a binary variable equal to one for banks that fail within one year. The control variables are defined as follows: *Size* is the logarithm of total assets, *Capital ratio* is the ratio of total equity capital to total assets, *Profitability* is the ratio of net income to total assets, *Loan growth* is the logarithm of loan growth, *Liquidity* is measured as the ratio of cash balances to total assets, *Residential RE loans* is the ratio of residential real estate loans to total loans, *Core deposits* is the core deposits ratio measured as all deposits less deposits in large time-deposit and large-brokered deposit accounts scaled by total deposits, *CEO duality* is a dummy variable which equals one for banks in which the CEO and Chair positions are held by the same individual, *Public* is a dummy variable for publicly traded banks, *Subchapter S* is assigned to one if a bank is organized under the subchapter-S, *MBHC* is a dummy variable for the banks that are affiliated with a multibank holding company, *RE shock* is a dummy variable for real estate shocks, *Unemployment* is the state unemployment rate, and *PCI* is the state per-capita income.

Table 3. Univariate tests based on propensity score matching.

	Male CEO	Female CEO	Difference	Male chair	Female chair	Difference	Male CEO and chair	Female CEO or chair	Difference
Panel A: All banks									
Non-accrual loans	1.06%	1.13%	0.06 *	1.07%	1.05%	-0.02	1.09%	1.10%	0.02
Loan charge-offs	0.10%	0.10%	-0.01	0.10%	0.10%	0.00	0.10%	0.10%	0.00
Z-score (log)	3.56	3.55	-0.01	3.58	3.54	-0.04 *	3.61	3.56	-0.04 *
Panel B: Banks affected by RE shocks:									
Non-accrual loans	2.29%	2.44%	0.15	2.41%	1.74%	-0.67 **	2.24%	2.25%	0.02
Loan charge-offs	0.26%	0.28%	0.02	0.22%	0.15%	-0.07 **	0.22%	0.23%	0.01
Z-score (log)	2.99	2.71	-0.28	2.68	3.29	0.60 ***	3.02	2.92	-0.10
Panel C: Banks with high RE exposure affected by RE shocks:									
Non-accrual loans	2.72%	2.18%	-0.54	3.72%	1.86%	-1.86 *	3.24%	2.03%	-1.22 *
Loan charge-offs	0.21%	0.11%	-0.10	0.22%	0.08%	-0.14 *	0.29%	0.08%	-0.21 ***
Z-score (log)	3.19	3.87	0.68	2.34	3.81	1.47 *	2.57	3.89	1.32 ***

The table reports the mean values of *Non-accrual loans*, *Loan charge-offs*, and *Z-score* and the results of two-tailed *t*-tests for the null hypothesis that there is no difference in the means between female-led and male-led banks. These *t*-tests are performed on propensity score matched samples in which the female-led banks are matched with male-led banks that are statistically indistinguishable from the female-led banks in terms of the control variables. *Non-accrual loans* is the ratio of non-accruing loans to total loans, *Loan charge-offs* is the ratio of loan charge-offs to total loans, and *Z-score* is the logarithm of the sum of the bank's return on assets and the equity capital ratio divided by the standard deviation of the return on assets over the previous five years. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 4. Regressions with loan charge-offs as the dependent variable.

	All banks			Banks with high RE exposure		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Test variables:						
Female CEO	-0.002			0.001		
	(0.003)			(0.009)		
Female chair		0.000			0.010	
		(0.003)			(0.010)	
Female CEO or chair			0.000			0.004
			(0.003)			(0.007)
Female CEO x RE shock	0.018			-0.094 ***		
	(0.023)			(0.028)		
Female chair x RE shock		-0.042 **			-0.132 ***	
		(0.020)			(0.026)	
Female CEO or chair x RE shock			-0.011			-0.126 ***
			(0.017)			(0.022)
RE shock	0.052 ***	0.055 ***	0.054 ***	0.102 ***	0.105 ***	0.108 ***
	(0.005)	(0.005)	(0.005)	(0.016)	(0.016)	(0.016)
Control variables:						
Size	0.013 ***	0.013 ***	0.013 ***	0.019 ***	0.019 ***	0.019 ***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
Capital ratio	-0.001 *	-0.001 *	-0.001 *	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Profitability	-0.019 ***	-0.019 ***	-0.019 ***	-0.018 ***	-0.018 ***	-0.018 ***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
Non-accrual loans	0.048 ***	0.048 ***	0.048 ***	0.052 ***	0.052 ***	0.052 ***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Loan growth	-0.028 ***	-0.028 ***	-0.028 ***	-0.017	-0.017	-0.017
	(0.005)	(0.005)	(0.005)	(0.011)	(0.011)	(0.011)
Liquidity	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 **	-0.001 **	-0.001 **
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Table 4. *Continued.*

	All banks			Banks with high RE exposure		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Residential RE loans	-0.086 ***	-0.087 ***	-0.087 ***	-0.041	-0.042	-0.043
	(0.010)	(0.010)	(0.010)	(0.054)	(0.054)	(0.054)
Core deposit	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***	-0.001 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CEO duality	0.001	0.001	0.001	0.003	0.003	0.003
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)
Public	0.010 ***	0.010 ***	0.010 ***	0.007	0.007	0.008
	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.006)
Subchapter S	0.007 ***	0.007 ***	0.007 ***	-0.015 **	-0.015 **	-0.015 **
	(0.002)	(0.002)	(0.002)	(0.007)	(0.007)	(0.007)
MBHC	0.007 ***	0.007 ***	0.007 ***	-0.006	-0.006	-0.006
	(0.002)	(0.002)	(0.002)	(0.008)	(0.008)	(0.008)
Unemployment	1.555 ***	1.556 ***	1.556 ***	3.485 ***	3.516 ***	3.508 ***
	(0.099)	(0.099)	(0.099)	(0.466)	(0.467)	(0.466)
PCI	-0.455	-0.454	-0.456	10.381 ***	10.415 ***	10.407 ***
	(0.564)	(0.563)	(0.564)	(1.337)	(1.342)	(1.344)
Inverse Mills ratio	No	No	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	54,312	54,312	54,312	5,383	5,383	5,383
Adjusted R^2	0.457	0.457	0.457	0.499	0.500	0.500

The table reports the estimates of alternative versions of Equation (1). The dependent variable is *Loan charge-offs* which is the ratio of loan charge-offs to total loans. The female variables in the regressions are defined as follows: *Female CEO* is a dummy variable which equals one for banks that have a female CEO, *Female chair* equals one if the bank's chairperson of the board of directors is a female, and *Female CEO or chair* is assigned to one if either the CEO or the board chair of the bank is a female. The control variables are defined as follows: *RE shock* is a dummy variable for real estate shocks, *Size* is the logarithm of total assets, *Capital ratio* is the ratio of total equity capital to total assets, *Profitability* is the ratio of net income to total assets, *Non-accrual loans* the ratio of non-accruing loans to total loans, *Loan growth* is the logarithm of loan growth, *Liquidity* is measured as the ratio of cash balances to total assets, *Residential RE loans* is the ratio of residential real estate loans to total loans, *Core deposits* is the core deposits ratio measured as all deposits less deposits in large time-deposit and large-brokered deposit accounts scaled by total deposits, *CEO duality* is a dummy variable which equals one for banks in which the CEO and Chair positions are held by the same individual, *Public* is a dummy variable for publicly traded banks, *Subchapter S* is assigned to one if a bank is organized under the subchapter-S, *MBHC* is a dummy variable for the banks that are affiliated with a multibank holding company, *Unemployment* is the state unemployment rate, and *PCI* is the state per-capita income. Robust standard errors corrected for clustering at the bank level are reported in parentheses. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 5. Regressions with non-accrual loans as the dependent variable.

	All banks			Banks with high RE exposure		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Female CEO	0.047			-0.083		
	(0.040)			(0.072)		
Female chair		0.008			0.006	
		(0.038)			(0.096)	
Female CEO or chair			0.035			-0.013
			(0.031)			(0.065)
Female CEO x RE shock	0.159			-0.615 **		
	(0.218)			(0.293)		
Female chair x RE shock		-0.412 **			-0.762 *	
		(0.174)			(0.438)	
Female CEO or chair x RE shock			-0.034			-0.670 **
			(0.164)			(0.329)
RE shock	0.617 ***	0.649 ***	0.630 ***	0.005	0.020	0.034
	(0.059)	(0.059)	(0.060)	(0.175)	(0.175)	(0.177)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Inverse Mills ratio	No	No	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	54,312	54,312	54,312	5,383	5,383	5,383
Adjusted R^2	0.370	0.370	0.370	0.576	0.576	0.576

The table reports the estimates of alternative versions of Equation (1). The dependent variable is *Non-accrual loans* which is the ratio of non-accruing loans to total loans. The female variables in the regressions are defined as follows: *Female CEO* is a dummy variable which equals one for banks that have a female CEO, *Female chair* equals one if the bank's chairperson of the board of directors is a female, and *Female CEO or chair* is assigned to one if either the CEO or the board chair of the bank is a female. The control variables are defined as follows: *RE shock* is a dummy variable for real estate shocks, *Size* is the logarithm of total assets, *Capital ratio* is the ratio of total equity capital to total assets, *Profitability* is the ratio of net income to total assets, *Loan charge-offs* is the ratio of loan charge-offs to total loans, *Loan growth* is the logarithm of loan growth, *Liquidity* is measured as the ratio of cash balances to total assets, *Residential RE loans* is the ratio of residential real estate loans to total loans, *Core deposits* is the core deposits ratio measured as all deposits less deposits in large time-deposit and large-brokered deposit accounts scaled by total deposits, *CEO duality* is a dummy variable which equals one for banks in which the CEO and Chair positions are held by the same individual, *Public* is a dummy variable for publicly traded banks, *Subchapter S* is assigned to one if a bank is organized under the subchapter-S, *MBHC* is a dummy variable for the banks that are affiliated with a multibank holding company, *Unemployment* is the state unemployment rate, and *PCI* is the state per-capita income. Robust standard errors corrected for clustering at the bank level are reported in parentheses. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 6. Regressions with Z-score as the dependent variable.

	All banks			Banks with high RE exposure		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Female CEO	0.002			0.069		
	(0.029)			(0.078)		
Female chair		-0.044			-0.048	
		(0.029)			(0.088)	
Female CEO or chair			-0.012			0.012
			(0.023)			(0.066)
Female CEO x RE shock	-0.037			0.869 ***		
	(0.118)			(0.211)		
Female chair x RE shock		0.334 ***			0.688 **	
		(0.110)			(0.297)	
Female CEO or chair x RE shock			0.101			0.802 ***
			(0.091)			(0.222)
RE shock	-0.212	-0.233	-0.224	-0.033	-0.031	-0.061
	(0.032)	(0.032)	(0.033)	(0.103)	(0.103)	(0.104)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Inverse Mills ratio	No	No	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	54,182	54,182	54,182	5,372	5,372	5,372
Adjusted R^2	0.349	0.349	0.349	0.379	0.378	0.379

The table reports the estimates of alternative versions of Equation (1). The dependent variable is the logarithm of *Z-score* which is calculated as the sum of the bank's return on assets and the equity capital ratio divided by the standard deviation of the return on assets over the previous five years. The female variables in the regressions are defined as follows: *Female CEO* is a dummy variable which equals one for banks that have a female CEO, *Female chair* equals one if the bank's chairperson of the board of directors is a female, and *Female CEO or chair* is assigned to one if either the CEO or the board chair of the bank is a female. The control variables are defined as follows: *RE shock* is a dummy variable for real estate shocks, *Size* is the logarithm of total assets, *Loan charge-offs* is the ratio of loan charge-offs to total loans, *Loan growth* is the logarithm of loan growth, *Liquidity* is measured as the ratio of cash balances to total assets, *Residential RE loans* is the ratio of residential real estate loans to total loans, *Core deposits* is the core deposits ratio measured as all deposits less deposits in large time-deposit and large-brokered deposit accounts scaled by total deposits, *CEO duality* is a dummy variable which equals one for banks in which the CEO and Chair positions are held by the same individual, *Public* is a dummy variable for publicly traded banks, *Subchapter S* is assigned to one if a bank is organized under the subchapter-S, *MBHC* is a dummy variable for the banks that are affiliated with a multibank holding company, *Unemployment* is the state unemployment rate, and *PCI* is the state per-capita income. Robust standard errors corrected for clustering at the bank level are reported in parentheses. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 7. Bank failure regressions.

	All banks			Banks with high RE exposure		
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Female CEO	-0.003 **			-0.010 **		
	(0.001)			(0.004)		
Female chair		0.000			-0.008	
		(0.001)			(0.006)	
Female CEO or chair			-0.002 *			-0.010 **
			(0.001)			(0.004)
Female CEO x RE shock	-0.024			-0.077 ***		
	(0.017)			(0.021)		
Female chair x RE shock		-0.047 ***			-0.074 ***	
		(0.006)			(0.020)	
Female CEO or chair x RE shock			-0.035 ***			-0.081 ***
			(0.011)			(0.020)
RE shock	0.033 ***	0.034 ***	0.035 ***	0.034 *	0.034 *	0.037 *
	(0.005)	(0.005)	(0.006)	(0.020)	(0.020)	(0.021)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Inverse Mills ratio	No	No	No	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	54,312	54,312	54,312	5,383	5,383	5,383
Adjusted R^2	0.053	0.054	0.054	0.082	0.081	0.083

The table reports the estimates of alternative versions of Equation (1). The dependent variable is *Bank failure* which is a binary variable equal to one for banks that fail within one year. The female variables in the regressions are defined as follows: *Female CEO* is a dummy variable which equals one for banks that have a female CEO, *Female chair* equals one if the bank's chairperson of the board of directors is a female, and *Female CEO or chair* is assigned to one if either the CEO or the board chair of the bank is a female. The control variables are defined as follows: *RE shock* is a dummy variable for real estate shocks, *Size* is the logarithm of total assets, *Capital ratio* is the ratio of total equity capital to total assets, *Profitability* is the ratio of net income to total assets, *Loan charge-offs* is the ratio of loan charge-offs to total loans, *Non-accrual loans* the ratio of non-accruing loans to total loans, *Loan growth* is the logarithm of loan growth, *Liquidity* is measured as the ratio of cash balances to total assets, *Residential RE loans* is the ratio of residential real estate loans to total loans, *Core deposits* is the core deposits ratio measured as all deposits less deposits in large time-deposit and large-brokered deposit accounts scaled by total deposits, *CEO duality* is a dummy variable which equals one for banks in which the CEO and Chair positions are held by the same individual, *Public* is a dummy variable for publicly traded banks, *Subchapter S* is assigned to one if a bank is organized under the subchapter-S, *MBHC* is a dummy variable for the banks that are affiliated with a multibank holding company, *Unemployment* is the state unemployment rate, and *PCI* is the state per-capita income. Robust standard errors corrected for clustering at the bank level are reported in parentheses. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.