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# Bank safety-oriented culture and lending decisions

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ABSTRACT

This study investigates the effects of bank safety-oriented cultures on loan contracts. We regress stock returns during the 1998 Long-Term Capital Management (LTCM) crisis on these risk-taking characteristics and obtain a residual component to proxy the safety-oriented culture of banks. Our empirical results show that banks with a safety-oriented culture increase the probability of signing a contract with low risk borrowers and that they charge lower loan spreads. We also find that these banks ask for more loan covenants to protect their creditor's rights. Finally, banks with a safety-oriented culture suffer less from borrowers' defaults and have higher market responses around the dates of loan announcements. Also, our findings reject the alternative hypothesis that banks with a safety-oriented culture only accept less risky lending due to their conservative risk attitude, thus destroying market value for banks.

> "…in a banking context, growth versus safety is a fundamental choice that shapes the bank's strategy as well as culture"
>
> – Song and Thakor (2019)

## 1. Introduction

An increasing number of studies address the influences of corporate culture in financial firms. For example, Fahlenbrach et al. (2012) propose that a bank has a persistent risk culture; thus, its performance in past crises could predict its performance in a subsequent crisis. Similarly, Ellul and Yerramilli (2013) find that banks with an aggressive risk culture are associated with weaker risk management. Ho et al. (2016) show that aggressive (conservative) banks hire overconfident (non-overconfident) managers who are willing to take more (less) risks. Houston and Shan (2019) suggest that banks are more likely to grant loans to borrowers with similar Environmental, Social, and Governance (ESG) profiles, and positively influence subsequent borrower ESG performance. Ashraf (2017) proposes that political and legal institutions work together to influence bank risk-taking. National culture has been material in determining bank risk-taking (Boubakri et al., 2017; Mourouzidou-Damtsa et al., 2019).

Recently, Song and Thakor (2019) develop a theoretical model to examine whether growth-oriented or safety-oriented culture affects bank outcomes. They find that a safety-oriented culture is likely to reduce a bank's focus on competition-induced excessive growth. They also suggest that the current regulatory can focus on strengthening bank risk culture to improve safety and push to elevate economic growth by stimulating bank lending. Such model implication, however, has not been tested in the empirical frontier. This study provides empirical evidence to investigate whether banks with a safety-oriented culture make superior lending decisions.

The safety-oriented culture can affect the terms of bank loans and enhance the lending quality of banks. For example, if a bank operates in a safety-oriented business model, it may only accept and approve the loans of borrowers with better quality. Therefore, banks with a safety-oriented culture are more likely to have stronger risk management that embraces risk and uncertainty. Accordingly, they have the ability to make better lending decisions. The bank culture, however, is hard to measure because the beliefs of employees are relatively unobservable.

This paper proposes a new measure of a bank safety-oriented culture based on a bank's persistence in stock performance during crises. As shown in Fahlenbrach et al. (2012), a bank's performance in past crises could predict its performance in a subsequent crisis because it has

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persistent risk culture that makes banks have similar decisions. For example, a bank may choose relatively risky borrowers or have under-diversification portfolios when it underestimates the potential risks—such implicit culture results in a bank's similar performance during different economic downturns. Among different characteristics, banks relying on more short-term funding, more leverage, and higher growth rate are more likely to have a business model that causes worse performance during crises. We regress stock returns during the 1998 Long-Term Capital Management (LTCM) crisis on these risk-taking characteristics and obtain a residual component. Suppose that these risk-taking characteristics capture the growth-oriented culture that banks herd on growth without enough cautions, the residual component is more likely to represent the safety-oriented culture, as shown in Song and Thakor (2019).

An understanding of bank culture is important. For example, private debt financing has become a more predominant source of new external funding around the world (Chava et al., 2009; Ghosh, 2015; Graham et al., 2008). A growing line of studies investigates the determinants of loan contracting from the demand side, such as the borrower's reputation (Sufi, 2007), accounting quality (Bharath et al., 2008; Graham et al., 2008), ownership structure (Lin et al., 2011), and political connections (Houston et al., 2014).[1] How the determinants of the supply side, especially the bank implicit perspective, may affect loan contracts is relatively unknown. Understanding how a bank's perspective affects its lending strategies and how the lending choice influences a bank's following performance can help address why banks perform similarly during crises, as shown in Fahlenbrach et al. (2012).

To investigate these issues, we collect 65,407 loan contracts between 1999 and 2017 from DealScan. We then collect accounting data from the Compustat database and the Center for Research in Security Prices (CRSP) database to construct a measure of bank culture. Due to calculating this measure, we delete samples established after the LTCM crisis. Finally, the sample comprises around 27,469 loan contracts from 2147 individual firms between 1999 and 2017.

The empirical results show that banks with a safety-oriented culture have an increased probability of signing a contract with low-risk borrowers over the sample period. The evidence stays strong when we control for lender, firm, and loan characteristics as well as macroeconomic factors, industry and year fixed effects, loan purposes, and loan type. Thus, we find that banks with a safety-oriented culture usually select high-quality borrowers who have lower credit and default risks. Second, our results show that these banks, on average, charge lower loan spreads to their high-quality borrowers. Third, these banks ask for more loan covenants to protect their creditors' rights. Fourth, they are less likely to suffer from the defaults of their borrowers in the future, which supports the borrowers' higher quality. Fifth, banks with a safety-oriented culture have higher market responses around the dates of loan announcements. So we find that these banks have better lending policies that maximize their loan profits. In addition, these findings reject the alternative hypothesis that banks with a safety-oriented culture only accept less risky lending due to their conservative risk attitude, thus destroying market value for banks.

Our work contributes to the literature in several ways. First, we relate bank safety-oriented cultures to loan contracting. In the literature, several studies find that the firms' cultures affect their corporate decisions (Cheng et al., 2015; Ellul and Yerramilli, 2013; Fahlenbrach et al., 2012; Ho et al., 2016).[2] However, no empirical evidence study has examined the influences of a bank's safety-oriented culture on its lending. Based on the theoretical model of Song and Thakor (2019), we propose a new measure of safety-oriented culture in the banking literature. We also extend these studies by investigating how this safety-oriented culture influences lending policies and banks' subsequent performance (Fahlenbrach et al., 2012).[3]

Second, this study also relates to the literature concerning banks' risk-taking in lending decisions. Dell'Ariccia and Marquez (2006) show that banks loosen lending standards as they obtain private information about borrowers which reduces the information asymmetries across banks. Acharya and Naqvi (2012) argue that loan officers have the incentive to increase lending by lowering interest rates if their compensation is linked to loan volume.[4] Complementing these studies, we decompose banks' implicit perspective and provide a reason why some banks approve lowly risky loans. We find that banks with a safety-oriented culture approve lowly risky loans and suffer less from their borrowers' defaults.

Third, our research complements several recent studies on the determinants of loan contracting (Bharath et al., 2011; Bui et al., 2021; Graham et al., 2008; Hasan et al., 2017; Houston et al., 2014; Lin et al., 2011; Sufi, 2007). We show that the bank's safety-oriented culture has a significant effect on loan contracts. Specifically, banks with a safety-oriented culture have better lending policies that maximize their loan profits.

Fourth, this study is closely related to the work of Giannetti and Yafeh (2012), who show that banks favor firms with a similar national culture by offering lower interest rates among different countries. Different from the county-level index they use, we focus on a bank-level culture that captures the safety-oriented culture of each bank. Further, we discuss other issues, such as: (1) banks with a safety-oriented culture have an increased probability of signing a contract with low-risk borrowers, and (2) we demonstrate that these banks are less likely to suffer from borrowers' defaults in the future.

This study is organized as follows: Section 2 develops the empirical hypotheses, Section 3 provides the culture measure and validation tests, Section 4 provides data and summary statistics, Section 5 presents the empirical results, and Section 6 concludes the paper.

## 2. Hypothesis development

An increasing number of studies examine the influences of corporate culture in financial performance and risk-taking (Bereskin et al., 2014; Guiso et al., 2015; Liu, 2016; Pan et al., 2017). In practice, Guiso et al. (2015) find that perceived integrity is positively related to firm performance, while Liu (2016) and Pan et al. (2017) show that cultures of corporate corruption and risk-taking are positively associated with firms' R&D expenditures and misconduct. Firms with safety-oriented corporate culture are likely to have higher financial performance and

[1] In addition, Ivashina and Scharfstein (2010) show that during the 2008 financial crisis, the borrowers of a liquidity-constrained bank may not have been able to easily switch to other less constrained ones. Chava and Purnanandam (2011) use an exogenous shock to the US banking system during the Russian crisis in the Fall of 1998 to examine the effect of credit demand on borrowers by using the supply of credit by the banks. Puri, Rocholl, and Steffen (2011) find evidence of a significant supply side effect in that the crisis-affected banks reject substantially more loan applications than non-affected banks during the period from 2006 to 2008 in Germany.

[2] Pan, Siegel, and Wang (2017) use Hofstede's (1980, 1991, 2001) uncertainty avoidance index and show that firms' attitudes toward risk are positively associated with their R&D expenditures.

[3] In this regard, this study also relates to researches on the types of banks that perform poorly during a financial crisis. Other studies have shown that banks that perform poorly during the crisis are those with more fragile financing and more shareholder-friendly boards (Beltratti and Stulz, 2012), those with weak risk management (Ellul and Yerramilli, 2013), and those with lower-quality regulatory capital ratios when the crisis began (Berger and Bouwman, 2013). This study adds to this literature by providing an implicit framework of how the bank's culture risk-taking characteristics, CEO characteristics, and corporate governance influence its performance during the crisis.

[4] Acharya and Naqvi (2019) model the investment preferences of bank managers and argue that the first priority of financial intermediaries with ample liquidity is to invest in risky projects and reap higher potential yields.

to take less risk.

Corporate culture also affects financial firms through their risk management and lending choices. Fahlenbrach et al. (2012) show that a financial institution has a persistent culture that makes its stock performance sensitive to consequent crises. Further, Ellul and Yerramilli (2013) find that banks with a good culture are associated with stronger risk management, such as a more active risk committee. When choosing managers, Ho et al. (2016) show that aggressive (conservative) banks hire overconfident (confident) managers who are willing to take a greater (less) risk. In terms of lending choice, Houston and Shan (2019) show that lenders tend to associate with borrowers that share their attitudes regarding ESG-related policies and/or have similarly observed reputations related to ESG issues.

Song and Thakor (2019) provide a theoretical foundation for the bank safety-oriented culture. Specifically, a bank will choose either growth- or safety-oriented culture in the beginning. The bank then determines its wage contract and designs loan contracts by seeking suitable borrowers. When a bank chooses a specific culture, it selects managers that have similar beliefs (e.g., optimistic banks choose relatively optimistic managers). The manager then puts more (less) effort into finding a loan to make when the wage contract encourages (discourages) him/her from doing so. Therefore, banks with a safety-oriented culture are likely to reduce a bank's focus on competition-induced excessive growth. Such culture-motivated lending choice helps banks screen out borrowers that have different risk attitudes with banks.

Following Ellul and Yerramilli (2013) and Song and Thakor (2019), we predict that banks with a safety-oriented corporate culture are likely to put more effort into controlling risk when they make loan contracts. To control for risk, the first priority is to screen out riskier borrowers (Ruckes, 2004). This screening helps banks reduce their monitoring costs and default probabilities. In contrast, banks with a growth-oriented culture may put relatively less effort into risk management. Altunbas et al. (2017) show that banks with relatively aggressive credit growth before the 2007–2009 crisis would suffer more in crisis. Bui et al. (2020) also find that changes in short interest predicted banks' loan quality and default risk during the 2007–2008 crisis. Fahlenbrach et al. (2012) find banks that have higher loan growth tend to underperform other banks in the next three years. Therefore, the above discussion motivates the following hypothesis:

H1: Banks with a safety-oriented culture are more likely to make loans to less risky borrowers.

Extending H1, banks are likely to charge these borrowers lower spreads. Booth (1992) find that loan spreads reflect financial contract costs of controlling borrower behavior toward the assets being financed. According to different ways that assess a borrower's risk, the literature shows that low-risk firms are often given lower spreads on their loans. Graham et al. (2008) show that loans initiated after restatement have significantly higher spreads, shorter maturities, higher collateral, and more covenant restrictions than the loans initiated before restatement. Lin et al. (2011) find that the cost of debt financing is significantly higher for companies with a wider divergence between the largest ultimate owner's control rights and cash-flow rights and investigate factors that affect this relation. Houston et al. (2014) find that the cost of bank loans is significantly lower for firms that have board members with political ties. Hasan et al. (2017) find that firms headquartered in US counties with higher levels of social capital incur lower loan spreads. When relatively safety-oriented banks are more likely to choose less risky borrowers, we put forward the following hypothesis:

H2: Banks with a safety-oriented culture charge less risky borrowers lower spreads.

Again, extending to H1, banks are also likely to use more covenants to lower the probability of default when drawing up loan contracts. Nini et al. (2009) show that banks are more likely to impose capital restrictions as borrowers' credit quality deteriorates, and the capital expenditure restrictions cause a reduction in firms' investments. Ahn and Choi (2009) indicate that borrowers' earnings management generally decreases as the strength of banks' monitoring increases. Demiroglu and James (2010) find that riskier firms and firms with fewer investment opportunities have tighter covenants. Because accepting covenants in loan contracts is costly for firms, banks usually require only high-risk firms to provide downside protection (Berger and Udell, 1990; Rajan and Winton, 1995; Chava and Roberts, 2008).

Risk management through screening and covenants helps lenders reduce their default probabilities and monitoring costs. For example, a bank may need to renegotiate a new contract with a higher interest rate and a reduced number of available credits after a violation of covenants (Roberts and Sufi, 2009). Such negotiation involves additional monitoring costs for banks.[5] Therefore, we predict that banks with a safety-oriented culture are likely to use more covenants and require more collateral to enhance their risk management of loan contracts; the efforts to screen and use covenants further reduce the default probabilities for banks with a safety-oriented culture (Beyhaghi et al., 2017). Based on the above discussions, we posit two hypotheses as follows:

H3: Banks with a safety-oriented culture are likely to increase the number of covenants.

H4: Banks with a safety-oriented culture suffer fewer loan defaults.

The cumulative abnormal returns (CARs) in the studies on loan announcements are helpful in evaluating a bank's lending quality and a firm's performance (Billett et al., 1995, 2006; James, 1987; Lummer and McConnell, 1989). For example, Shockley and Thakor (1997) observe that announcements of loan contracts have several essential features: (1) a lower loan spread is the result of a firm's credit risk premium; (2) a loan announcement is a flexible commitment that can be customized to meet the firm's needs and includes restrictive covenants; and (3) it provides a mechanism for banks to decide fee structures and identify borrowers. Slovin et al. (1992) find that the renewal of credit agreements with banks depends on favorable stock prices, especially for small firms, because the latter is less abundant in public information, and banks must provide external monitoring.

Differently, the decision to announce a loan acquisition is, in most cases, discretionary when the announcement comes from borrowers or other participants. The announcement, therefore, may not have an effect on the borrower's stock. For example, Diamond (1985) and Verrecchia (2001) show that loan disclosure can benefit firms because it lowers the information asymmetry between a borrowing firm and its investors. Investors can save costs generated from costly information acquisitions. Billett et al. (1995) report significant abnormal returns for borrowers from the loan announcement. Similarly, if the market is efficient, it should respond better when lenders have better lending decisions. We thus posit the following hypothesis:

H5: Banks with a safety-oriented culture receive a better market response to their loan announcements.

## 3. Measure of bank culture and validation tests

Fahlenbrach et al. (2012) use the stock performance during the 1998 LTCM crisis to predict the performance during the 2008 financial crisis to show the banks that perform worse before are more likely to suffer in a subsequent crisis. Banks are not likely to change their behavior even if they have experienced economic downturns. Such evidence shows that a persistent implicit bank culture may drive bank decisions and the

[5] Song and Thakor (2019) show that safety-oriented banks tend to find employees and borrowers that have more consistent beliefs. Ho et al. (2016) and Houston and Shan (2019) also provide evidence for this belief mechanism related to overconfident and ESG-activated borrowers. When a bank is seeking to attract borrowers with lower default risk, our results show that banks prefer to use more non-pricing covenants with lower spread. Jarrow, Krishenik, and Minca (2018) also predict that banks may lower their loan spread when borrowers show a stronger ability in liquidity management, because these borrowers can more easily fulfill the requirement of covenants.

subsequent results during crises. They further show that banks that rely more on short-term funding, have more leverage, and grow more are more likely to have a business model that causes worse performance during both crises. Inspired by their study, we decompose the bank culture into two different components: risk-taking and non-risk-taking.

$$LTCMcrisisreturn_{i,1998} = \delta_1 + \beta' BANK_{i,1997} + \theta' Z_{i,1997} + \nu_j + \mu_{i,1998} \quad (1)$$

where *LTCM crisis return* is the annualized buy-and-hold returns during the LTCM crisis (i.e., the period from August 3, 1998, to the day in 1998 on which the bank's stock attained its lowest price); $BANK_{i,1997}$ is the risk-taking characteristics of banks in the fiscal year 1997 such as short-term funding, book leverage ratio, and asset growth. We also control for other variables $Z$ and industry fixed effect $\nu$.[6]

The risk-taking component, thus, is the predicted value from regression Model (1) that reflects the bank culture attributed to the growth-oriented culture, while the residual of Model (1), $\mu$, measures the bank culture attributed to the safety-oriented culture as shown in Song and Thakor (2019). Therefore, we use the residual, $Bank\ Culture_{1998}$, to represent a bank safety-oriented culture. When a bank adjusts portfolios based on the choice between growth and safety, the increase in residual can predict a relatively safety-oriented culture due to its business model.[7] According to this methodology, we also exclude 30 banks that appeared after 1999 because they have a missing value of the culture measure.

### 3.1. Bank safety-oriented culture and stock performance

To validate that our measure can predict bank performance, we follow Fahlenbrach et al. (2012) and use a two-stage least-squares (2SLS) procedure to examine the validation of our measure of bank safety-oriented culture. We first estimate $Bank\ Culture_{1998}$ with regression Model (1). Next, we use our measure to predict a bank's stock performance during the 2008 financial crisis that is as follows:

$$RE08_{i,2008} = \alpha_1 + \alpha_2 BankCulture_{i,1998} + \beta' BANK_{i,2007} + \theta' Z_{i,2007} + \nu_j + \varepsilon_{i,2008}, \quad (2)$$

where *RE08 (Crisis return)* is the annualized buy-and-hold returns from July 1, 2007, through December 31, 2008;$Bank\ Culture_{i,1998}$ is the safety-oriented culture from the 1st-stage regression; $BANK_{i,2007}$ is a vector of risk-taking characteristics for bank $i$ in fiscal year 2007; $Z_{i,2007}$ is a vector of other variables for firm $i$ in year 2007; $\nu_j$ captures the industry fixed effects for industry $j$; and $\varepsilon_{i,2008}$ is the random error. The risk-taking characteristics are *L_Leverage* (book value of assets minus the book value of equity plus the market value of equity that is divided by the market value of equity), *STFunding* (debt in current liabilities divided by total liabilities), and *AssetG* (the annualized growth rate of total assets from the previous two years of data). All variables are defined in Appendix A. Appendix B presents the summary statistics for the variables used in the validation test.

[6] The other controls variables ($Z$) are *BHAR0607* (the buy-and-hold returns from July 1, 2006, through June 30, 2007), *L_Asset* (log of total assets), *BM* (book value of common equity divided by market value of common equity), *TCE ratio* (tangible common equity ratio: tangible common equity divided by tangible assets and multiplied by 100), *Beta* (banks' equity beta from a market model of daily returns in excess of the 3-month T-bills that uses previous 2-year data, where the market is represented by the value-weighted CRSP index), *Idiosyncratic volatility (IDIORISK*, standard deviations of the residuals obtained from a market model of daily returns in excess of the 3-month T-bills that uses previous 2-year data), *MES (%)* (marginal expected shortfall as defined in Acharya, Pedersen, Philippon, and Richardson, 2010) that is measured as the 5 % worst days for the value-weighted CRSP market return in the previous 2-year data).

[7] Appendix D presents a ranking of the bank's safety-oriented culture.

Table 1 presents the results. Overall, we find a significant and positive effect of *Bank Culture*. A one-standard-deviation increase in the *Bank Culture* is associated with a 4.83 % (0.2457 ×0.1964) increase in the annualized buy-and-hold stock return during the 2008 financial crisis without controlling for other variables. As shown in Column (3), the economic effect of *Bank Culture* only slightly changes after controlling for the risk-taking factors and other firm characteristics. We also control for the risk-taking component in 1997 or the buy-and-hold stock return between 2006 and 2007 in Columns (4) and (5), respectively. The results confirm that banks with a safety-oriented culture in their business model have better stock performance during the 2008 financial crisis.

In terms of economic effects, the effect of *Bank Culture* is 4.64 % after controlling for all other risk-taking characteristics. Compared with the one-standard-deviation effect of culture proposed in Fahlenbrach et al. (2012) that causes an approximately 5.18 % (0.155 ×0.3342) increase in the *Crisis Return*, our safety-oriented culture measure can explain around 90% of their measure. Our measure, therefore, is both statistically significant and economically meaningful. In sum, the results in Table 1 provide evidence in support of the risk culture effect found in Fahlenbrach et al. (2012), being more likely to be driven by the safety-oriented culture than the risk-taking component.

### 3.2. Bank safety-oriented culture, default risk, and loan quality

We next use the default probability and loan quality to represent banks' performance during the 2008 financial crisis. We follow Bharath and Shumway (2008) and Altunbas et al. (2010) to construct the expected default frequency (*EDF*) that measures the default probability in a specified period based on the modified KMV model.[8] We use the change in EDF ($\Delta EDF$) between 2006 and 2008 to represent the increase in default risk during the 2008 financial crisis. We also use the change in nonperforming loans to represent their quality.

Column (1) of Table 2 presents the regression results related to default risk. The *Bank Culture,* in general, has negative effects on default risk while controlling for the risk-taking characteristics and others of banks. The results thus confirm our expectation that banks with a safety-oriented culture had lower default risk during the 2008 financial crisis.

We next test the effect of a bank safety-oriented culture on the change in the nonperforming loan ratio of banks during the 2008 financial crisis. Ho et al. (2016) find that overconfident banks with higher levels of risk-taking suffered more in terms of more nonperforming loans (*NPL*) during the 2008 financial crisis. Column (2) of Table 2 presents the regression results. Similarly, we find that *Bank Culture* leads to a negative change in *NPL* during the 2008 financial crisis. A safety-oriented culture not only leads to a bank's better stock performance but also lowers default risk and raises loan quality during the 2008 financial crisis.

### 3.3. Additional control of CEO characteristics and corporate governance

We also address the concern that our results might be driven by the CEO's personality rather than the corporate culture. Recently, an increasing number of studies show the importance of the CEO's perspective on the stock performance of a firm during a crisis. First, Fahlenbrach and Stulz (2011) show that a bank performs worse during an economic downturn when the CEO holds a higher stake. Second, these studies show that the CEO's ability and skills are correlated with firm performance. Firms with high-performing CEOs enjoy more

[8] It is a forward-looking measure of implied credit risk. Higher *EDF* means higher default risk. Specifically, the formula for the EDF is as follows: $EDF = N\left(-\left(\frac{\ln\left(\frac{V}{F}\right)+\left(\mu-0.5\sigma_V^2\right)T}{\sigma_V\sqrt{T}}\right)\right)$. All variables in the equation are based on Merton's distance-to-default model (Merton, 1974). The detailed procedure to estimate the EDF can be found in (Bharath and Shumway, 2008).

**Table 1**
Validation test (I): financial crisis return.

| Dep. Var | *RE08* | *RE08* | *RE08* | *RE08* | *RE08* |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| *Bank Culture* | 0.2457*** | 0.2589*** | 0.2455*** | 0.2433*** | 0.2361*** |
| | (6.73) | (5.96) | (6.40) | (6.33) | (5.57) |
| *L_Leverage* | | -0.0132*** | -0.0085 | -0.0028 | -0.0025 |
| | | (−4.07) | (−1.36) | (−0.57) | (−0.52) |
| *STFunding* | | 0.2580* | 0.3230*** | 0.4854** | 0.4897** |
| | | (2.15) | (3.71) | (3.58) | (3.70) |
| *AssetG* | | -0.0179 | -0.0332 | -0.0335 | -0.0321 |
| | | (−0.81) | (−0.85) | (−0.81) | (−0.75) |
| *L_Asset* | | | -0.0036 | 0.0029 | 0.0014 |
| | | | (−0.75) | (0.51) | (0.18) |
| *BM* | | | -0.0592 | -0.0657 | -0.0658 |
| | | | (−0.75) | (−0.92) | (−0.91) |
| *TCE* | | | 0.0015 | 0.0015 | 0.0014 |
| | | | (1.67) | (1.84) | (1.71) |
| *Beta* | | | -0.1339 | -0.1495 | -0.1434 |
| | | | (−1.31) | (−1.46) | (−1.37) |
| *IDIORISK* | | | 0.0471*** | 0.0510*** | 0.0513** |
| | | | (3.81) | (4.10) | (3.19) |
| *MES* | | | -16.2918** | -16.6541** | -16.3995** |
| | | | (−2.50) | (−2.54) | (−2.61) |
| *L_Leverage97* | | | | -0.0061 | -0.0068 |
| | | | | (−1.39) | (−1.65) |
| *STFunding97* | | | | -0.3074** | -0.3090** |
| | | | | (−2.87) | (−2.92) |
| *AssetG97* | | | | -0.0021* | -0.0022* |
| | | | | (−2.40) | (−2.42) |
| *BHAR0607* | | | | | -0.0257 |
| | | | | | (−0.39) |
| *Constant* | -0.3284*** | -0.2448*** | -0.3773*** | -0.4134*** | -0.4046*** |
| | (−5254.57) | (−10.77) | (−4.99) | (−5.57) | (−4.47) |
| *Adj* $R^2$ | 0.0708 | 0.0810 | 0.1731 | 0.1830 | 0.1828 |
| *Obs.* | 499 | 495 | 483 | 483 | 467 |

This table presents the results of a two-stage least-squares (2SLS) regression on the bank safety-oriented culture and the 2008 financial crisis returns. The crisis period is from July 1, 2007, through December 31, 2008.
Stage 1: Regress LTCM crisis return on the bank risk-taking characteristics ($BANK_{i,t-1}$) and other exogenous variables of the model:

$$LTCMcrisisreturn_{i,1998} = \delta_1 + \beta' BANK_{i,1997} + \theta' Z_{i,1997} + \nu_j + \mu_{i,1998}$$

Stage 2: Using a residual component to represent the safety-oriented culture of a bank (*Risk Culture*) from the 1st-stage regression:

$$RE08_{i,2008} = \alpha_1 + \alpha_2 BankCulture_i + \beta' BANK_{i,2007} + \theta' Z_{i,2007} + \nu_j + \varepsilon_{i,2008}$$

where *LTCM crisis return* is the annualized buy-and-hold returns during the LTCM crisis period; *RE08 (Crisis return)* is the annualized buy-and-hold returns from July 1, 2007, through December 31, 2008; *Bank Culture*$_i$ is the residual component of bank safety-oriented culture from the 1st-stage regression; $BANK_i$ is a vector of risk-taking characteristics for bank $i$ in year 1997 or 2007; $Z_i$ is a vector of other exogenous variables for firm $i$ in year 1997 or 2007; $\nu_j$ capture the industry fixed effects; $\mu_i$and $\varepsilon_i$ are the random errors. The variable definitions are in Appendix A. In all the equations, we report $t$-values based on standard errors adjusted for heteroskedasticity and sample clustering at the bank level (White, 1980; Petersen, 2009). The superscripts * , * *, and * ** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

favorable loan contracts during a crisis, while firms with relatively low-performing CEOs are less likely to obtain loan contracts and less likely to bypass attractive investment projects (Campello and Graham, 2013).[9] We retest the specifications used in Eq. (2) with additional control for the CEO's characteristics, such as managerial ability, risk incentives, compensation, and shareholding to ensure that our results are independent of these characteristics.

As a proxy for managerial ability, we use the general managerial ability index (*GAI*) from the study of Custódio et al. (2013).[10] Further, the CEO's incentives are measured with *DELTA, VEGA, TOTALPAY*, and *CEOholding*. First, *DELTA* (*VEGA*) is the change in the CEO's stock and option portfolio per one-percent change in stock price (stock return volatility). *TOTALPAY* consists of the CEO's compensation through salary, bonus, restricted stock, and other benefits as well as *CEOholding,* which is a CEO's ownership of company stock. *TOTALPAY* and *CEOholding* are transformed into a natural log form.

Similarly, we address the issue that our results are attributed to corporate governance rather than culture. In terms of corporate governance, Francis et al. (2012) find that firms with more independent boards (i.e., where outside directors are less connected with the current CEO) and more outside financial experts perform better during a crisis than other firms. Conversely, Beltratti and Stulz (2012) show that firms with more friendly boards have a worse performance during a crisis. To represent corporate governance, we use two important governance indices: the G-index (Gompers et al., 2003) and the GOV41 index (Aggarwal et al., 2011). In addition, we use the data from RiskMetrics to estimate the independence of the board, *INDEPENDT*, as the percentage of outside directors on the board.

Columns (3) to (9) of Table 2 present the results related to *RE08* with

[9] Likewise, (Cornaggia et al., 2017) find that firms with high managerial ability have more favorable credit ratings, especially among those facing financial distress or competitive pressure.

[10] Custódio et al. (2013) consider five aspects of a CEO's professional career: past number of (1) positions, (2) firms, and (3) industries; (4) whether the CEO held that position at a different company; and (5) whether the CEO worked for a conglomerate. They find that generalist CEOs could be particularly important at the time of shocks to the firm, and they might be hired to perform difficult tasks such as restructurings and acquisitions. This finding could be a reason why firms are willing to reward generalist CEOs with a premium over specialists.

**Table 2**
Validation tests (II).

| Dep. Var | *ΔEDF* | *ΔNPL* | *RE08* | *RE08* | *RE08* | *RE08* | *RE08* | *RE08* | *RE08* |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *Bank Culture* | -0.3738** | -0.0413* | 0.4503*** | 0.4016*** | 0.3561*** | 0.2895* | 0.3376*** | 0.3218** | 0.3050* |
| | (−2.69) | (−2.29) | (5.74) | (4.27) | (4.77) | (2.05) | (10.56) | (3.78) | (1.97) |
| *GAI* | | | 0.0351* | | | | | | |
| | | | (2.10) | | | | | | |
| *DELTA* | | | | 0.0274 | | | | | |
| | | | | (1.97) | | | | | |
| *VEGA* | | | | -0.0002 | | | | | |
| | | | | (−0.01) | | | | | |
| *TOTALPAY* | | | | | -0.0000** | | | | |
| | | | | | (−3.01) | | | | |
| *CEOholding* | | | | | | 0.0005 | | | |
| | | | | | | (0.07) | | | |
| *GOV41* | | | | | | | -0.0983 | | |
| | | | | | | | (−0.30) | | |
| *Gindex* | | | | | | | | -0.0167* | |
| | | | | | | | | (−2.23) | |
| *INDEPENDT* | | | | | | | | | 0.2336 |
| | | | | | | | | | (1.02) |
| *Constant* | 0.0155 | 0.0021 | 0.3772 | 0.3847 | 0.1704 | 0.7086** | -0.0948 | 0.7487** | 0.1422 |
| | (0.09) | (0.15) | (1.94) | (1.89) | (1.70) | (3.12) | (−0.94) | (2.69) | (0.65) |
| *Control for* | | | | | | | | | |
| *Control variables* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Adj* $R^2$ | 0.1607 | 0.1117 | 0.3134 | 0.3199 | 0.2989 | 0.3216 | 0.5154 | 0.3142 | 0.4023 |
| *Obs.* | 224 | 283 | 145 | 83 | 148 | 100 | 160 | 96 | 77 |

This table presents several validation tests for the measure of bank safety-oriented culture. In Models (1) and (2), we use alternative crisis performances (*ΔEDF* and *ΔNPL*) to replace *RE08* and re-estimate the regressions. In Models (3) to (9), we present the regression results of *RE08* after we consider CEO characteristics (*GAI, DELTA, VEGA, TOTALPAY*, and *CEOholding*) and corporate governance (*GOV41, Gindex, and INDEPENDT)* of firms. Where *ΔEDF* is change in expected default frequency between crisis years (2007–2008) and year 2006; the EDF is the percentile ranking of a firm's default risk based on its distance to default (constructed from Bharath and Shumway, 2008);*ΔNPL* is change in the ratio of nonperforming loans to total gross loans between crisis years (2007–2008) and year 2006; Nonperforming loans are defined as loans with interest payments and principal more than 90 days overdue;*GAI* is the general managerial ability index; *DELTA* is the dollar change in portfolio value for a 0.01 change in the annualized standard deviation of stock returns (Core and Guay (2002)); *VEGA* is the dollar change in portfolio value for a 1 % change in the stock price (Core and Guay (2002)); *TOTALPAY* includes salary, bonus, stock awards, option awards, long-term incentive plans, and other annual compensation such as perquisites and other personal benefits; *CEOholding* is the percentage of deltas of shares and stock options held by a CEO as a fraction of the total delta associated with all outstanding shares; *GOV41* used 41 individual attributes of a firm in four categories (i.e., board, audit, anti-takeover provisions, and compensation-ownership); *G-index* is the governance indices; *INDEPENDT* is the percentage of outside directors. The variable definitions are in Appendix A. In all the equations, we report *t*-values based on standard errors adjusted for heteroskedasticity and clustering robust standard error (White, 1980; Petersen, 2009). The superscripts * , * *, and * ** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

controls for CEO characteristics (*GAI, DELTA, VEGA, TOTALPAY*, and *CEOholding*) and corporate governance (*GOV41, Gindex,* and *INDEPENDT)* calculated for 2006. *Bank Culture* still has positive and significant effects on *RE08*, while most CEO characteristics and corporate governances have relatively weak effects on stock performance during the 2008 financial crisis. Overall, the results show that CEO characteristics and corporate governance do not dominate our previous findings.

### 3.4. Bank safety-oriented culture and banks' risk taking

Finally, we test whether banks with relatively safe-oriented cultures tend to take less risk. We adopt the natural logarithm of bank *Z-score* ((ROA+Capital asset raito)/Standard deviation (ROA)) (Lepetit and Strobel, 2013), standard deviation of ROA for years $t+1$ to $t+5$, standard deviation of return for the twelve months in year *t*, loan growth, and asset growth to measure risk taking behaviors.

Following Laeven and Levine (2009), Houston et al. (2010), and Ellul and Yerramilli (2013), we use the following regression model to test the effects of the bank safety-oriented culture on its risk-taking behavior.

$$RiskTakings_{j,t} = \alpha_0 + \alpha_1 BankCulture_{i,1998} + + \beta' \mathrm{BANKi}, -1 + \mu t + \varepsilon j, t \quad (3)$$

where$RiskTakings_{j,t}$ are the measures of bank *j*'s risk taking behaviors in year *t*; $BankCulture_{i,1998}$is the measure of bank culture, $Bank\ Culture_{i,1998}$ is the measure of the unobservable culture of a bank; $\pi$ is the year fixed effect, and $\varepsilon$ is the error term. We do not control for the bank or industry fixed effect because bank safety-oriented culture remains constant in the same industry.

Table 3 presents the regression results. According to the results, the coefficients for *Bank Culture* are significantly and positively related to bank's z-socre and negatively related to standard deviation of ROA, loan growth, and assets growth. These results support our hypothesis that banks with relatively safety-oriented cultures tend to take less risk. These risk-taking attitudes could influence banks' risk taking generally at any time rather than during the crisis period.

**Table 3**
Validation tests (III).

| | *Bank Z-score* | *ROA_SD* | *RET_SD* | *Loan growth* | *Asset growth* |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| *Bank Culture* | 0.2018*** | -0.0011** | 0.0035 | -0.4479* | -0.0027** |
| | (2.73) | (−5.47) | (0.47) | (−1.83) | (−2.00) |
| *L_Asset* | 0.0389*** | -0.0002 | -0.0044*** | -0.1161** | -0.0005*** |
| | (4.52) | (−1.76) | (−3.53) | (−2.34) | (−3.55) |
| *L_Leverage* | -0.0123*** | 0.0001* | 0.0018*** | -0.0189 | -0.0000 |
| | (−4.97) | (2.93) | (5.27) | (−1.11) | (−0.99) |
| *L_ROA* | 23.74*** | -0.1307 | -1.0224*** | -5.0706 | 0.2590*** |
| | (9.18) | (−2.45) | (−5.05) | (−0.51) | (8.32) |
| *L_Tier1* | 0.0076 | 0.0000 | -0.0001 | -0.0198 | 0.0003*** |
| | (1.18) | (0.46) | (−0.20) | (−0.69) | (2.73) |
| *Beta* | -0.2943*** | 0.0021** | 0.0262*** | -0.0017 | -0.0017*** |
| | (−7.55) | (4.45) | (5.52) | (−0.01) | (−2.82) |
| *TCE Ratio* | 4.04*** | 0.0301* | -0.1737** | -4.8915 | 0.0083 |
| | (3.70) | (3.77) | (−2.06) | (−1.61) | (0.47) |
| *Constant* | 3.2752* | 0.0016*** | 0.2331*** | 2.6724** | -0.0031* |
| | (1.88) | (18.11) | (20.84) | (2.58) | (−1.67) |
| *Control for* | | | | | |
| *Year FE* | Yes | Yes | Yes | Yes | Yes |
| *Adj. $R^2$* | 0.2883 | 0.2388 | 0.4688 | 0.0548 | 0.1208 |
| *Obs.* | 3333 | 3376 | 3590 | 687 | 3505 |

This table presents several validation tests for the measure of bank safety-oriented culture. We use an OLS for the estimation of bank risk-taking behaviors, the empirical model is:

$$RiskTakings_{i,t} = \alpha_0 + \alpha_1 BankCulture_{i,1998} + \beta' \mathrm{BANKi,t-1} + \mu t + \varepsilon,$$

Where *Risk Takings*$_{j,t}$ is the measure of firm *i's* risk taking behaviors(e.g., *Bank Z-score*, *ROA_SD, RET_SD, Loan growth,* and *Assets growth*). Bank Z-score is bank Z-score,which is caculated as (ROA+Capital Asset raito)/Standard Deviation (ROA),we use the natural logarithm of the value; ROA_SD is the standard deviation of ROA, which is estimated using ROA in the next five years; RET_SD is the standard deviation of return, which is estimated using return in the given year; loan growth is the increase in loansize of this year compared to the previous year; and asset growth is the increase in assets of this year compared to the previous year. *RiskCulture*$_{i,1998}$ is the measure of unobservable culture of a bank, *BANK*$_{it-1}$ are vectors of control variables for bank i in year *t*-1, The variable definitions are in Appendix A. In all the equations, we report *t*-values based on standard errors adjusted for heteroskedasticity and sample clustering robust standard error (White, 1980; Petersen, 2009). The superscripts * , * *, and * ** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

## 4. Data and summary statistics

### 4.1. Data

We construct our sample by using data from DealScan, annual Compustat files, CRSP, and Datastream for the period from 1999 to 2017. The Compustat files contain financial statement items to construct our measure; CRSP provides stock return data; DealScan provides loan characteristics such as the spread, maturity, size, collateral, covenants, purpose, and type; Datastream contains macroeconomic variables. We choose 1999 as the first year of the sample to focus on lenders established after the LTCM crisis. To identify lenders and borrowers, we refer to lenders as financial firms with standard industrial classification (SIC) codes between 6000 and 6999 and borrowers to nonfinancial firms with other SIC codes. To address potential outlier problems, we winsorize all accounting variables at the 1st and 99th percentiles. The above process constructs a sample that comprises around 27,469 loan contracts from 2147 individual firms.

**Table 4**
Summary statistics.

| Variable | (1) Mean | (2) Std. Dev. | (3) Centile | (4) | (5) |
|---|---|---|---|---|---|
| | | | P25 | P50 | P75 |
| Bank Culture | -0.0281 | 0.1052 | -0.1434 | -0.0031 | 0.0022 |
| *L_Asset* | 13.5303 | 1.1074 | 12.7803 | 13.9204 | 14.5601 |
| *L_Leverage* | 13.8201 | 6.9912 | 9.9493 | 11.1703 | 14.4402 |
| *L_ROA* | 0.0212 | 0.0073 | 0.0161 | 0.0214 | 0.0263 |
| *L_Tier1* | 10.6101 | 2.3982 | 8.2203 | 11.1604 | 12.4502 |
| *Spread* | 5.1062 | 0.7432 | 4.7323 | 5.1703 | 5.6201 |
| *Loan Size* | 5.4894 | 1.5521 | 4.6153 | 5.6203 | 6.5532 |
| *Loan Maturity* | 3.7904 | 0.5883 | 3.6113 | 4.1114 | 4.1114 |
| *Collateral* | 0.4651 | 0.4992 | 0.0000 | 0.0000 | 1.0000 |
| *Syndicate* | 0.9502 | 0.2193 | 1.0000 | 1.0000 | 1.0000 |
| *Gencov* | 4.0361 | 3.0213 | 1.0000 | 4.0000 | 6.0000 |
| *Fincov* | 1.6362 | 1.1271 | 1.0000 | 2.0000 | 2.0000 |
| *Totalcov* | 5.6723 | 4.0342 | 2.0000 | 6.0000 | 8.0000 |
| *Assets* | 7.9901 | 2.0052 | 6.6703 | 7.9172 | 9.2401 |
| *Market-to-book* | 1.6532 | 0.8651 | 1.1103 | 1.3824 | 1.8623 |
| *Leverage* | 0.3334 | 0.2201 | 0.1772 | 0.3091 | 0.4582 |
| *Profitability* | 0.1224 | 0.0781 | 0.0802 | 0.1162 | 0.1601 |
| *Tangibility* | 0.2981 | 0.2542 | 0.0843 | 0.2174 | 0.4823 |
| *Z-score* | 1.5411 | 1.2661 | 0.7611 | 1.4591 | 2.2741 |
| *Term Spread* | 1.4701 | 0.8623 | 0.9601 | 1.5602 | 2.2201 |
| *Credit Spread* | -1.0051 | 0.3313 | -1.1503 | -0.9203 | -0.8101 |
| *EDF* | 0.0701 | 0.1810 | 0.0000 | 0.0003 | 0.0213 |
| *DUVOL* | 0.4151 | 0.9471 | -0.0021 | 0.2942 | 0.5462 |
| *NCSKEW* | 0.3663 | 1.3992 | -0.1802 | 0.0762 | 0.5191 |
| *CAR_total* | 0.00040 | 0.0471 | -0.0195 | -0.00055 | 0.0199 |

This table presents the summary statistics for the variables used in bank lending decisions. The variable definitions are in Appendix A.

### 4.2. Abnormal stock returns

We construct abnormal returns based on the four-factor Carhart model to adjust for risk factors (Carhart, 1997). Similar to Billett et al., (1995, 2006) and Barber et al. (2009), we calculate the fitted returns $AdjR_{i,t}$ for each stock *i* on day *t* from a pricing model estimated in the

**Table 5**
Borrower characteristics for high and low safety-oriented culture banks.

| Variables | High Safety-oriented Culture (Top 25 %) | | Low Safety-oriented Culture (Bottom 25 %) | | High-Low |
|---|---|---|---|---|---|
| | *Obs.* | *Mean* | *Obs.* | *Mean* | *Difference* |
| *L_Asset* | 5081 | 12.291 | 7412 | 13.552 | -1.261*** |
| *L_Leverage* | 5081 | 12.392 | 7412 | 21.346 | -8.954*** |
| *L_ROA* | 4790 | 0.022 | 7103 | 0.016 | 0.006*** |
| *L_Tier1* | 5081 | 9.477 | 7412 | 11.739 | -2.262*** |
| *Spread* | 4832 | 5.045 | 7042 | 5.154 | -0.109*** |
| *Loan Size* | 5080 | 4.913 | 7412 | 5.774 | -0.861*** |
| *Loan Maturity* | 4921 | 3.68 | 7309 | 3.822 | -0.143*** |
| *Collateral* | 5081 | 0.457 | 7412 | 0.453 | 0.004 |
| *Syndicate* | 5081 | 0.927 | 7412 | 0.911 | 0.016*** |
| *Gencov* | 5081 | 4.042 | 7412 | 3.443 | 0.598*** |
| *Fincov* | 5081 | 1.742 | 7412 | 1.358 | 0.384*** |
| *Totalcov* | 5081 | 5.784 | 7412 | 4.801 | 0.982*** |
| *Assets* | 5067 | 7.367 | 7364 | 8.587 | -1.221*** |
| *MB* | 4659 | 1.631 | 6707 | 1.638 | -0.007 |
| *Leverage* | 5041 | 0.322 | 7343 | 0.335 | -0.013*** |
| *Profitability* | 4916 | 0.122 | 7240 | 0.113 | 0.009*** |
| *Tangibility* | 4909 | 0.311 | 7247 | 0.299 | 0.012** |
| *Z-score* | 4141 | 1.655 | 6179 | 1.238 | 0.417*** |
| *EDF* | 3353 | 0.060 | 4315 | 0.084 | -0.024*** |
| *DUVOL* | 1699 | 0.250 | 4425 | 0.259 | -0.009 |
| *NCSKEW* | 1699 | 0.183 | 4425 | 0.227 | -0.044* |
| *CAR_total* | 2766 | -0.000 | 2598 | -0.001 | -0.000 |

This table presents the mean difference between the high culture and low safety-oriented culture groups. Variable definitions are in Appendix A. The superscripts * , * *, and * ** denote the significance of the *t*-test for the difference in the means between the two subsamples at 10 %, 5 %, and 1 % levels, respectively.

period from $t = -200$ to $t = -30$. Specifically, we regress the time series of a stock's excess returns (i.e., $Return_{i,t}$ less the risk-free rate $R_f$) on the common factors of the pricing model. In the Carhart model, the common factors are $R_m$ - $R_f$, *SMB*, *HML*, and the momentum (*UMD*) factor.

After obtaining the normal returns for each stock *i* on day *t*,we define the daily abnormal returns (*AR*) as the difference between a stock's excess return and its fitted returns. The formula is as follows:

$$AR_{i,t} = R_{i,t} - R_{f,t} - AdjR_{i,t} \quad (4)$$

### 4.3. Summary statistics

Table 4 presents the summary statistics. *Bank Culture* has a mean of − 0.028 and a standard deviation of 0.105. Compared with the LTCM crisis return shown in Fahlenbrach et al. (2012) that has a mean of − 0.26 and a standard deviation of 0.12, our measure is relatively close to a normal distribution. In terms of loan characteristics, 95 % of the sample is syndicated loan, and the average spread is 5.106 ($e^{5.106}$ = 165.009 basis point) with a standard deviation of 0.922. The average number of general covenants (*Gencov*), financial covenants (*Fincov*), and total covenants (*Totalcov*) are 4.036, 1.636, and 5.672, respectively.

Table 5 shows the results from comparing the borrower characteristics of loans from banks with high and low safety-oriented culture. Specifically, we define banks with a safety-oriented culture that are in the top quartile as high culture banks, while banks are in the bottom quartile as low culture banks. This approach helps us understand the structure and choice of lending by high culture banks compared with those of low culture banks.

To sum up, borrowers of high culture banks have higher *Profitability*, *Tangibility*, and *Z-score* than those of low culture banks. Borrowers of high culture banks also have a lower *Market-to-book* and *Leverage Ratio* than those of their counterparts. In addition, high culture banks ask their borrowers for lower loan spreads but more covenants. The results indicate that high culture banks choose less risky borrowers, ask for lower spreads, but require more covenants.

## 5. Empirical results

### 5.1. Bank's culture and borrower's credit risk

To test H1, we use the following logit and OLS regressions to investigate whether banks with a safety-oriented culture lend loans to borrowers with relatively low credit risks. We construct the regression models according to Graham et al. (2008), Hasan et al. (2014), and Bui et al. (2021).

$$\begin{aligned}\mathrm{CreditRiskj,} = &\alpha_0 + \alpha_1 Bank\ Culture_{i,1998} + \beta\text{'BANKi,t}-1 \\ &+ \gamma\text{'FIRMj,t}-1 + \theta\text{'Zi,} + \mathrm{vj} + \mu\mathrm{t} + \varepsilon\mathrm{j,t}\end{aligned} \quad (5)$$

where $Credit\ Risk_{j,t}$ is the measure of firm *j*'s credit risk (i.e., *Z-score*, and *EDF*) in year *t*; $Bank\ Culture_{i,1998}$ is the measure of the unobservable culture of a bank; $BANK_{i,t-1}$ and $FIRM_{j,t-1}$ are vectors of control variables for bank *i* and firm *j* in year *t-1*; $Z_{I,t}$ is the vector of the control variables for loan and macroeconomic factor *i* in year *t*; $\nu_j$ and $\pi_t$ are the industry and year fixed effects, respectively; and $\varepsilon_{j,t}$ is the error term. We control for borrower's characteristics to make sure that our results are not driven by reversed causality that valuable borrowers choose banks rather than banks select less risky borrowers.

In regression Models (4), *BANK* comprises four risk-taking characteristics (*L_Asset*, *L_Leverage*, *L_ROA*, and *L_Tier1*), and *FIRM* comprises six firm characteristics (*Asset, Market-to-book, Leverage, Profitability, Tangibility, and Z-score*). The *Z* contains four loan characteristics (*Loan Size*, *Loan Maturity*, *Collateral*, and *Syndicate*), two macroeconomics factors (*Credit Spread* and *Term Spread*), and the purpose and type of loans.

The analysis focuses on the coefficient for $Bank\ Culture_{i,1998}$. A positive (negative) coefficient for *Z-score* (*EDF*) supports our first hypothesis that banks with safety-oriented culture are more likely to make loans to less risky firms.

In this study, variables for the lender's characteristics are *L_Asset*, *L_Leverage*, *L_ROA* (ratio of net income to total assets), and *L_Tier 1* (tier 1 capital ratio is the ratio of a bank's core equity capital to its total risk-weighted assets, which is calculated according to the Basel Accord for reporting risk-adjusted capital adequacy). The variables for loan characteristics are *Spread* (all-in spread drawn from DealScan in percentage that is the difference between the interest rate that the borrower pays and LIBOR), *Loan Maturity* (natural logarithm of loan maturity in months), *Loan Size* (natural logarithm of the loan amount in US$ million), *Collateral* (a dummy variable that equals one if a loan is secured and zero otherwise), *Syndicate* (a dummy variable that equals one if a loan is syndicated and zero otherwise), *Fincov* (number of financial covenants), *Gencov* (number of general covenants), *Totalcov* (number of total covenants), *Loan type* (dummy variables for loan types, such as term loan, revolving loans longer than one year, revolving loans shorter than one year, and a 364-day facility), and *Loan purpose* (dummy variables for loan purposes, such as corporate purposes, debt repayment, working capital, and takeover).[11]

Table 6 presents the results. In Column (1), we find that banks with a safety-oriented culture are more likely to lend to firms with higher *Z-score*. When the bank culture increases by one percent, the borrower is likely to increase its *Z-score* by 1.40 %. The effects of the bank culture are larger than those of other bank characteristics such as assets and leverage. Columns (2) give the results from using *EDF* as a measure of credit risks. Similarly, banks with a safety-oriented culture are also likely to choose borrowers with higher Z-scores and lower EDFs that both indicate lower credit risks. Overall, these results support our first hypothesis that banks with a safety-oriented culture are more likely to make loans to less risky firms.

### 5.2. Bank culture and borrower's crash risk

Dewally and Shao (2013) find that an increase in opacity is significantly and positively related to an increase in banks' future stock price crash risk. This shows that the bank's culture has a great impact on its crash risk. Dang et al. (2022) study the relation between intrastate bank deregulation and corporate borrowers' stock price crash risk and they find that bank branch reform has a negative effect on firms' crash risk. Chen et al. (2022) find that green lending significantly reduces high-polluting firms' stock price crash risk. Therefore, we use two measures of borrower's crash risks to test our H1 again. Compared with credit risks that focus on the possibility that a borrower will fail to repay a loan or to meet contractual obligations, crash risks measure the probability of a crash when a firm experiences a loss in stock returns.

First, *NCSKEW* is measured by the negative skewness using weekly returns within each quarter (Chen et al., 2001). Stocks with a greater *NCSKEW* are more susceptible to crash risk. Second, we use down-to-up volatility, *DUVOL*, to capture the volatility of stock returns during down periods. For any stock *i* over any six-month period *t*, we separate all the days with returns below the period mean (“down’’ days) from those

[11] The variables for borrowers' characteristics are *Assets* (natural logarithm of total assets of the firms in US$ million), *Market-to-book* (market value of net assets to the book value of net assets ratio), *Leverage* (long-term debt plus debt in current liabilities divided by total assets), *Profitability* (earnings before interest, taxes, depreciation, and amortization divided by total assets), *Tangibility* (net property, plant, and equipment divided by total assets), and the *Z-score* (modified Altman's Z-score that equals [(1.2 × working capital +1.4 × retained earnings + 3.3 × EBIT+ 0.999 × sales) / total assets]). The macroeconomic variables are *Credit spread* (difference between the AAA and BAA corporate bond yields) and *Term spread* (difference between the 10-year and 2-year Treasury yields).

**Table 6**
Bank safety-oriented culture and credit risks.

| Dep. Var | Z-score | *EDF* |
|---|---|---|
| Model | OLS | OLS |
| | (2) | (3) |
| *Bank Culture* | 0.6662*** | -0.0316** |
| | (3.90) | (−2.05) |
| *L_Asset* | 0.0775*** | 0.0051*** |
| | (5.85) | (4.36) |
| *L_Leverage* | 0.0001 | -0.0002 |
| | (0.03) | (−0.58) |
| *L_ROA* | -5.5174** | 0.2565 |
| | (−2.06) | (1.03) |
| *L_Tier1* | -0.1259*** | -0.0004 |
| | (−7.86) | (−0.29) |
| *Assets* | -0.0242* | -0.0051*** |
| | (−1.65) | (−3.41) |
| *Market-to-book* | -0.1508*** | -0.0070*** |
| | (−7.79) | (−3.38) |
| *Leverage* | -1.2092*** | 0.1615*** |
| | (−10.89) | (15.59) |
| *Profitability* | 7.6766*** | -0.4161*** |
| | (27.18) | (−14.03) |
| *Tangibility* | -0.4553*** | 0.0174 |
| | (−3.97) | (1.50) |
| *Z-score* | | -0.0015 |
| | | (−0.81) |
| *Loan Size* | 0.0268** | -0.0025** |
| | (2.18) | (−2.04) |
| *Loan Maturity* | 0.1104*** | -0.0380*** |
| | (3.26) | (−7.73) |
| *Collateral* | -0.1023*** | 0.0250*** |
| | (−3.69) | (8.87) |
| *Syndicate* | 0.2173*** | -0.0018 |
| | (2.79) | (−0.17) |
| *Term Spread* | 0.0324 | -0.0025 |
| | (0.64) | (−0.42) |
| *Credit Spread* | -0.1133 | -0.1386*** |
| | (−1.18) | (−11.83) |
| *Constant* | 0.9817*** | 0.0684* |
| | (2.84) | (1.87) |
| *Control for* | | |
| *Loan purpose* | Yes | Yes |
| *Loan type* | Yes | Yes |
| *Rating* | Yes | Yes |
| *Industry FE* | Yes | Yes |
| *Year FE* | Yes | Yes |
| *Adj.*$R^2$ | 0.5672 | 0.4096 |
| *Obs.* | 20,991 | 16,679 |

This table presents the results for the bank safety-oriented culture on the lending decisions with different risk types for borrowers. In Models (1) and (2), we use an OLS for the estimation. The empirical model is:

$$\text{CreditRiskj,} = \alpha 0 + \alpha 1\text{Bank Culture}_{i,1998} + \beta\text{'BANKi,t} - 1 + \gamma\text{'FIRMj,t} - 1 + \theta\text{'Zi,t} + \text{vj} + \mu t + \varepsilon j,t$$

where *Credit Risk*$_{j,t}$ is the measure of firm *j*'s credit risk (e.g., *Z-score*, and *EDF*) in year *t*, *Z-score* is the modified Altman's Z-score (1.2 × working capital + 1.4 × retained earnings + 3.3 × EBIT+ 0.999 × sales)/ total assets, *EDF* is the percentile ranking of a firm's default risk based on its distance to default (constructed from Bharath and Shumway, 2008). *Risk Culture*$_{i,1998}$ is the measure of unobservable culture of a bank, *BANK*$_{i,t-1}$ and *FIRM*$_{j,t-1}$ are vectors of control variables for bank *i* and firm *j* in year *t-1*, $Z_{i,t}$is the vector of the control variables for loan and macroeconomic factor *i* in year *t*, $\nu_j$ and $\pi_t$ are the industry and year fixed effects, respectively, and $\varepsilon_{j,t}$ is the error term. The variable definitions are in Appendix A. In all the equations, we report *t*-values based on standard errors adjusted for heteroskedasticity and sample clustering at the bank level (White, 1980; Petersen, 2009). The superscripts * , * *, and * ** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

with returns above the period mean ("up'' days) and compute the standard deviation for each of these subsamples. We then take the log of the ratio of the standard deviation on the down days to the standard deviation on the up days.

We use the following regression model to test the effects of the bank safety-oriented culture on borrower's crash risks.

$$\begin{aligned} \textit{Crash risk}_{j,t} =& \alpha_0 + \alpha_1 \textit{Bank Culture}_{i,1998} + \beta'\text{BANKi,} - 1 \\ &+ \gamma'\text{FIRMj,t} - 1 + \theta'\text{Zi,} + \text{vj} + \mu t + \varepsilon j,t \end{aligned} \quad (6)$$

where *Crash risk*$_{j,t}$is the measure of firm *j*'s crash risk (i.e., *NCSKEW* and *DUVOL*) in year *t*, *Bank Culture*$_{i,1998}$is the measure of bank culture, and the other variables in the regression are similar to those in Model (4). A negative coefficient for *Bank Culture* with *NCSKEW* and *DUVOL* will support H1.

Table 7 presents the regression results. In Columns (1) and (2), the coefficients for *Bank Culture* are significantly and negatively related to the borrower's crash risks. For the economic magnitude, a one-standard-deviation increase in the safety-oriented culture leads to a decrease of 3.62 % (0.1052 ×(−0.3438) × 100) in the *NCSKEW*, and a decrease of 2.38 % (0.1052 ×(−0.2263) × 100) in the *DUVOL*. These findings indicate that banks with a safety-oriented culture lend more to firms that have not only lower credit risks but also lower default risks that are consistent with H1.

### 5.3. Bank culture and loan spread

In this subsection, we examine whether a bank safety-oriented culture affects the borrower's financing costs. Following Graham et al. (2008) and Hasan et al. (2014), we use the following regression model to investigate the effects of bank safety-oriented culture on the loan spread:

$$\begin{aligned} \text{Spreadj,} =& \alpha_0 + \alpha_1 \textit{Bank Culture}_{i,1998} + \beta'\text{BANKi,t} - 1 + \gamma'\text{FIRMj,t} - 1 \\ &+ \theta'\text{Zi,} + \text{vj} + \mu t + \varepsilon j,t, \end{aligned} \quad (7)$$

where *spread*$_{j,t}$ represents the loan spread of firm *j* in year *t*, *Bank Culture*$_{i,1998}$ is the measure of the unobservable culture of a bank, and the other variables in the regression are similar to those in Eq. (5).[12] Additionally, Song and Thakor (2019) suggest a CEO-bank matching mechanism in their risk attitude. It means that CEOs play an important role in banks' decisions and their risk-taking. So, we control bank CEO characteristics and bank governance to mitigate omitted-variable concerns. A negative coefficient for *Bank Culture* will support H2.

Table 8 presents the results. In Columns (1) to (4), we control for bank characteristics, borrower characteristics, loan characteristics, and macroeconomic variables to test the independent effects of bank culture on the loan spread. After controlling for other factors, the coefficients for *Bank Culture* are significantly and negatively related to loan spreads. For the economic magnitude, a one-standard-deviation increase in the bank safety-oriented culture leads to a decrease of 3.09 % (0.1052 × (−0.2942) × 100) in the loan spread. Given that the average loan spread of the sample firms is 164 ($e^{5.1062}$ − 1) bps, it can reduce the annual interest rate by approximately 5.06 bps. Therefore, results are not only statistically significant but are also economically important, supporting H2 that banks with a safety-oriented culture are likely to charge lower loan spreads to borrowers. Therefore, results support H2 that banks with a safety-oriented culture are likely to charge lower loan spreads to borrowers.

### 5.4. Bank culture and loan covenants

To test whether banks with a safety-oriented culture ask for more covenants from their borrowers, following Chen et al. (2022), we use

[12] We also present the Pearson correlation matrix between the variables in Appendix C. A few variables such as *L_Leverage*, *L_ROA*, *Assets*, *Loansize*, *Profitability*, and *Z-score* have relatively high correlation coefficients with other variables. We have used an alternative specifications that exclude theses varaibles and found a similar results.

**Table 7**
Bank safety-oriented culture and crash risks.

| Dep. Var | *NCSKEW* | *DUVOL* |
|---|---|---|
| | (1) | (2) |
| *Bank Culture* | -0.3438** | -0.2263** |
| | (−2.13) | (−2.48) |
| *L_Asset* | 0.0005 | 0.0039 |
| | (0.04) | (0.53) |
| *L_Leverage* | -0.0038 | -0.0020 |
| | (−1.30) | (−1.15) |
| *L_ROA* | 1.3686 | 1.3827 |
| | (0.62) | (1.12) |
| *L_Tier1* | 0.0052 | -0.0003 |
| | (0.49) | (−0.05) |
| *Assets* | 0.2048*** | 0.1163*** |
| | (5.58) | (5.43) |
| *Market-to-book* | 0.1927*** | 0.1201*** |
| | (7.16) | (7.74) |
| *Leverage* | 0.0974 | -0.0222 |
| | (0.70) | (−0.27) |
| *Profitability* | -0.4784 | -0.2169 |
| | (−1.52) | (−1.22) |
| *Tangibility* | 0.0012 | 0.1257 |
| | (0.01) | (1.04) |
| *Z-score* | 0.0370 | 0.0121 |
| | (1.07) | (0.62) |
| *Loan Size* | -0.0165 | -0.0123* |
| | (−1.38) | (−1.74) |
| *Loan Maturity* | -0.0265 | -0.0124 |
| | (−1.06) | (−0.64) |
| *Collateral* | 0.0399 | 0.0179 |
| | (1.29) | (0.99) |
| *Syndicate* | -0.0377 | -0.0057 |
| | (−0.44) | (−0.12) |
| *Term Spread* | 0.0056 | -0.0344 |
| | (0.17) | (−1.03) |
| *Credit Spread* | 0.0144 | -0.1643*** |
| | (0.58) | (−2.65) |
| *Constant* | -0.2311 | -0.6851*** |
| | (−0.93) | (−2.88) |
| *Control for* | | |
| *Loan purpose* | Yes | Yes |
| *Loan type* | Yes | Yes |
| *Rating* | Yes | Yes |
| *Industry FE* | Yes | Yes |
| *Year FE* | Yes | Yes |
| *Adj.*$R^2$ | 0.5684 | 0.5878 |
| *Obs.* | 16,578 | 15,833 |

This table presents the results for the bank safety-oriented culture on the lending decisions with different risk types for borrowers. We use an OLS for the estimation. The empirical model is:

$$\text{CrashRisk}j, = \alpha 0 + \alpha 1\text{Bank Culture}_{i,1998} + \beta\text{'BANK}i,t-1 + \gamma\text{'FIRM}j,t-1 + \theta\text{'Z}i,t + \text{vj} + \mu t + \varepsilon j,t$$

where Crash $\text{Risk}_{j,t}$ is the measure of firm *j*'s crash risk (e.g., *NCSKEW* and *DUVOL*) in year *t*, *NCSKEW* is negative for the third moment of firm-specific weekly returns in a year and is normalized by the standard deviation of the firm-specific weekly returns raised to the third power, and *DUVOL* is the log of the ratio of the standard deviation of firm-specific weekly returns for down weeks to the standard deviation of firm-specific weekly returns for up weeks. Down weeks are all the weeks with firm-specific weekly returns below the annual mean and up weeks are those with firm-specific returns above the annual mean. $Bank\ Culture_{i,1998}$ is a measure that represents the unobservable culture of bank *i*. $BANK_{i,t-1}$ is a vector of bank risk-taking characteristics for bank *i* in year *t* –1, $FIRM_{j,t-1}$ is a vector of control variables for firm *i* in year *t*–1, $Z_{i,t}$ is the vector of the control variables for loan and macroeconomic factors in year *t*, $\nu_j$ and $\pi_t$ are the industry and year fixed effects respectively, and $\varepsilon_{j,t}$ is the random error. The variable definitions are in Appendix A. In all the equations, we report *t*-values based on standard errors adjusted for heteroskedasticity and sample clustering at the bank level (White, 1980; Petersen, 2009). The superscripts * , * *, and * ** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

**Table 8**
Bank safety-oriented culture and loan spread.

| Dep. Var | *Spread* | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Bank Culture* | -0.3470*** | -0.3047*** | -0.3013*** | -0.2942*** |
| | (−5.62) | (−4.35) | (−4.57) | (−4.60) |
| *L_Asset* | -0.0716*** | -0.0347*** | -0.0256*** | -0.0253*** |
| | (−10.37) | (−6.91) | (−6.09) | (−5.91) |
| *L_Leverage* | -0.0080*** | -0.0062*** | -0.0061*** | -0.0060*** |
| | (−6.51) | (−3.81) | (−3.69) | (−3.80) |
| *L_ROA* | -0.3611 | -2.0708* | -2.6570** | -2.1353* |
| | (−0.39) | (−1.69) | (−2.14) | (−1.76) |
| *L_Tier1* | 0.0357*** | 0.0176*** | 0.0134*** | 0.0128*** |
| | (6.99) | (4.42) | (3.43) | (3.36) |
| *Assets* | | -0.1155*** | -0.0531*** | -0.0372*** |
| | | (−15.21) | (−5.70) | (−4.21) |
| *Market-to-book* | | -0.0629*** | -0.0503*** | -0.0454*** |
| | | (−6.98) | (−6.18) | (−6.84) |
| *Leverage* | | 0.4090*** | 0.4202*** | 0.3807*** |
| | | (7.91) | (8.26) | (8.13) |
| *Profitability* | | -1.1046*** | -0.9999*** | -0.8734*** |
| | | (−7.68) | (−7.89) | (−7.78) |
| *Tangibility* | | -0.0021 | -0.0090 | -0.0135 |
| | | (−0.05) | (−0.20) | (−0.36) |
| *Z-score* | | -0.0286*** | -0.0232** | -0.0192** |
| | | (−3.11) | (−2.44) | (−2.07) |
| *Loan Size* | | | -0.1125*** | -0.1076*** |
| | | | (−8.78) | (−9.03) |
| *Loan Maturity* | | | -0.0305 | -0.0339 |
| | | | (−1.26) | (−1.34) |
| *Collateral* | | | 0.2498*** | 0.2477*** |
| | | | (18.30) | (17.49) |
| *Syndicate* | | | 0.1622*** | 0.1639*** |
| | | | (5.30) | (5.46) |
| *Term Spread* | | | | 0.0271* |
| | | | | (1.85) |
| *Credit Spread* | | | | -0.0963*** |
| | | | | (−4.37) |
| *Constant* | 5.7469*** | 6.3302*** | 6.2261*** | 5.8601*** |
| | (47.99) | (63.49) | (52.75) | (45.42) |
| *Control for* | | | | |
| *Loan purpose* | Yes | Yes | Yes | Yes |
| *Loan type* | Yes | Yes | Yes | Yes |
| *Rating* | Yes | Yes | Yes | Yes |
| *Industry FE* | Yes | Yes | Yes | Yes |
| *Year FE* | Yes | Yes | Yes | Yes |
| *Adj.*$R^2$ | 0.5827 | 0.6248 | 0.6486 | 0.6672 |
| *Obs.* | 27,469 | 21,666 | 21,312 | 20,728 |

This table presents the results from the OLS on the effect of bank safety-oriented culture on the loan spread. The empirical model is:

$$\text{Spreadj}, = \alpha 0 + \alpha 1\text{Bank Culture}_{i,1998} + \beta\text{'BANK}i,t-1 + \gamma\text{'FIRM}j,t-1 + \theta\text{'Z}i,t + \text{vj} + \mu t + \varepsilon j,t$$

where $Spread_{j,t}$ represents the bank loan spread of firm *j* in year *t*;$Bank\ Culture_{i,1998}$ is a measure that represents the unobservable culture of bank *i*. $BANK_{i,t-1}$ is a vector of risk-taking characteristics for bank *i* in year *t* –1, $FIRM_{j,t-1}$ is a vector of control variables for firm *i* in year *t*–1, $Z_{i,t}$ is the vector of the control variables for loan and macroeconomic factors in year *t*, $\nu_j$ and $\pi_t$ are the industry and year fixed effects respectively, and $\varepsilon_{j,t}$ is the random error. The variable definitions are in Appendix A. In all the equations, we report *t*-values based on standard errors adjusted for heteroskedasticity and sample clustering at the bank level (White, 1980; Petersen, 2009). The superscripts * , * *, and * ** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

three covenants as dependent variables in Table 9. The regression model is as follows:

$$\text{Yj}, = \alpha_0 + \alpha_1 Bank\ Culture_{i,1998} + \beta'\text{BANK}i,t-1 + \gamma'\text{FIRM}j,t-1 + \theta'\text{Z}i, + \text{vj} + \mu t + \varepsilon j,t \quad (8)$$

where the dependent variables $Y_{j,t}$ refer to loan covenants such as

**Table 9**
Bank safety-oriented culture and loan covenants.

| | *Totalcov* | *Fincov* | *Gencov* |
|---|---|---|---|
| | (1) | (2) | (3) |
| *Bank Culture* | 0.5925** | 0.0588 | 0.5338** |
| | (2.11) | (0.74) | (2.52) |
| *L_Asset* | 0.0386 | 0.0060 | 0.0326* |
| | (1.50) | (0.80) | (1.71) |
| *L_Leverage* | -0.0129** | -0.0050*** | -0.0079* |
| | (−2.39) | (−3.24) | (−1.95) |
| *L_ROA* | 3.4646 | -0.8740 | 4.3386 |
| | (0.76) | (−0.67) | (1.27) |
| *L_Tier1* | -0.1751*** | -0.0478*** | -0.1273*** |
| | (−8.45) | (−7.88) | (−8.14) |
| *Assets* | -0.3387*** | -0.1024*** | -0.2363*** |
| | (−13.22) | (−13.93) | (−12.31) |
| *Market-to-book* | -0.1317*** | -0.0466*** | -0.0851*** |
| | (−5.02) | (−6.11) | (−4.31) |
| *Leverage* | -0.1814 | -0.0082 | -0.1732 |
| | (−1.17) | (−0.18) | (−1.50) |
| *Profitability* | 2.1161*** | 0.3891*** | 1.7271*** |
| | (5.63) | (3.57) | (6.06) |
| *Tangibility* | -0.3325** | -0.1021** | -0.2303* |
| | (−1.98) | (−2.12) | (−1.83) |
| *Z-score* | 0.0606** | 0.0148* | 0.0458** |
| | (2.23) | (1.86) | (2.23) |
| *Loan Size* | 0.5228*** | 0.1299*** | 0.3930*** |
| | (20.60) | (17.38) | (20.92) |
| *Loan Maturity* | 0.3530*** | 0.0467** | 0.3063*** |
| | (4.80) | (2.14) | (5.63) |
| *Collateral* | 3.2841*** | 0.8149*** | 2.4692*** |
| | (53.91) | (45.37) | (54.75) |
| *Syndicate* | 2.2764*** | 0.4400*** | 1.8364*** |
| | (20.44) | (13.47) | (21.47) |
| *Term Spread* | -0.1307 | -0.0201 | -0.1107 |
| | (−1.23) | (−0.66) | (−1.38) |
| *Credit Spread* | -0.7578*** | -0.2141*** | -0.5436*** |
| | (−3.78) | (−3.77) | (−3.60) |
| *Constant* | 1.5937** | 1.1971*** | 0.3966 |
| | (2.47) | (6.40) | (0.82) |
| *Control for* | | | |
| *Loan purpose* | Yes | Yes | Yes |
| *Loan type* | Yes | Yes | Yes |
| *Rating* | Yes | Yes | Yes |
| *Industry FE* | Yes | Yes | Yes |
| *Year FE* | Yes | Yes | Yes |
| *Adj. $R^2$* | 0.3024 | 0.2838 | 0.2994 |
| *Obs.* | 20,979 | 20,979 | 20,979 |

This table presents the regression results for the bank safety-oriented culture on loan covenants. We use an OLS for the estimation:
Yj, = α0 + α1Bank Culture$_{i,1998}$ + β'BANKi,t − 1 + γ'FIRMj,t − 1 + θ'Zi,t + vj + μt + εj,t
where $Y_{j,t}$ are *Totalcov*, *Fincov*, and *Gencov*. *Totalcov* is the total number of covenants; *Fincov* is the number of financial covenants; *Gencov* is the number of general covenants. *Bank Culture*$_{i,1998}$ is a measure that represents the unobservable culture of bank *i*. $BANK_{i,t-1}$ is a vector of risk-taking characteristics for bank *i* in year *t* –1, $FIRM_{j,t-1}$ is a vector of control variables for firm *i* in year *t*–1, $Z_{i,t}$ is the vector of the control variables for loan and macroeconomic factors in year *t*, $\nu_j$ and $\pi_t$ are the industry and year fixed effects respectively, and $\varepsilon_{j,t}$ is the random error. The variable definitions are in Appendix A. In all the equations, we report *t*-values based on standard errors adjusted for heteroskedasticity and sample clustering at the bank level (White, 1980; Petersen, 2009). The superscripts * , * *, and * ** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

*Totalcov*, *Fincov*, and *Gencov* for firm *j* in year *t*. The analysis focuses on the coefficient for *Bank Culture*$_{i,1998}$, and the other variables in the regression are similar to those in Section 5.3. Positive coefficients for *Totalcov*, *Fincov*, and *Gencov* will support H3.

Table 9 presents the results. In Column (1), the coefficient for *Bank Culture* is significantly and positively related to the total number of covenants. We further separate the total number of covenants into financial covenants and general covenants and find that the increase in the total number of covenants is more likely to be driven by general covenants rather than financial covenants.

In sum, the results of Table 9 show that banks with a safety-oriented culture are likely to use more covenants, especially through general terms rather than financial ratios, to ensure that borrowers will not default in the future, which is consistent with H3. Combined with the findings in Table 8, our results show that banks prefer to use more non-pricing covenants with lower spreads when a bank is seeking borrowers with lower default risk.

### 5.5. Bank lending quality

In this subsection, we further investigate whether banks with a safety-oriented culture have superior lending quality. We use the probability of borrowers' default and the announcement effect of the loan to test this issue.

#### 5.5.1. Bank's culture and borrowers' default

We first test whether banks with a safety-oriented culture suffer from fewer defaults in the future. The defaults are obtained from Moody's analytics default and recovery database that records a firm's default, such as a distressed exchange, dividend omission, interest default, Chapter 11, or Chapter 7. Among these events, some firms violate dividend omission, missed interest payments, distressed exchange, or other default events. However, in some extreme cases, borrowers may perform worse and suffer from Chapter 11 reorganization or Chapter 7 liquidation. To test whether the bank's safety-oriented culture can predict default, we follow Graham et al. (2008) and Hasan et al. (2014) and use the following logistic regression:

$$\Pr(Default_{j,t+n} = 1\left(BankCulture_{i,1998}, FIRM_{j,t-1}, Z_{i,t}\right) =$$

$$L(\alpha_0+\alpha_1 Bank\,Culture_{i,1998}+\beta'\mathrm{BANKi},-1+\gamma'\mathrm{FIRMj,t}-1+\theta'\mathrm{Zi,t}+\mathrm{vj}+\mu\mathrm{t}), \quad (9)$$

where $Default_{j,t+n}$ is a dummy variable that equals one if the borrower has a default. All other variables are similar to those in Model (4). A negative coefficient for *Bank Culture* will support H4.

Column (1) of Table 10 presents the results. After controlling for other factors, *Bank Culture* has significant and negative effects on the probability of loan default. A one-standard-deviation increase in *Bank Culture* leads to a 20.85 % (0.1052 × −1.9820) decrease in the probability of default. This finding supports H4 that banks with a safety-oriented culture suffer fewer defaults by their borrowers.

#### 5.5.2. Bank culture and abnormal returns around loan announcements

In this subsection, we further investigate whether banks with a safety-oriented culture have higher cumulated abnormal returns (CAR) around the loan announcement date. To test this issue, we define *CAR_total* as the CAR of both lenders and borrowers (value-weight by firm size). We use the following regression model to test this issue:

$$CAR\_totali = \alpha_0 + \alpha_1 Bank\ Culture_{i,1998} + \beta'\mathrm{BANKi},-1+\gamma'\mathrm{FIRMj,t}-1 + \theta'\mathrm{Zi,t}+\mathrm{vj}+\mu\mathrm{t}+\varepsilon\mathrm{j} \quad (10)$$

A positive coefficient for *Bank Culture* on the combined CAR will support H5.

Column (2) of Table 10 presents the results, and we find that *Bank Culture* is positively related to the announcement effects of lenders that support H5, in which banks with a safety-oriented culture are likely to have higher CARs around loan announcements. There's an increase of 10-day CAR for 1.84 % benefits these lenders' and borrowers' combined market value.

**Table 10**
Bank safety-oriented culture and lending quality.

| Dep. Var | *Default* | *CAR_total* |
|---|---|---|
| | (1) | (2) |
| *Bank Culture* | -1.9820*** | 0.0184** |
| | (−2.69) | (2.20) |
| *L_Asset* | 0.1825** | -0.0013 |
| | (2.30) | (−0.94) |
| *L_Leverage* | -0.0434** | 0.0007* |
| | (−2.26) | (1.84) |
| *L_ROA* | 0.1708 | 0.2598 |
| | (0.01) | (1.45) |
| *L_Tier1* | 0.0768 | -0.0011 |
| | (1.36) | (−1.28) |
| *Assets* | 0.0695 | -0.0039 |
| | (0.67) | (−1.27) |
| *Market-to-book* | -0.1990 | 0.0008 |
| | (−1.39) | (0.36) |
| *Leverage* | 1.5565*** | 0.0087 |
| | (4.26) | (0.73) |
| *Profitability* | -1.2884*** | 0.0156 |
| | (−5.21) | (0.61) |
| *Tangibility* | 0.2393 | 0.0022 |
| | (0.44) | (0.17) |
| *Z-score* | 0.0403*** | 0.0003 |
| | (2.91) | (0.10) |
| *Loan Size* | -0.0357 | |
| | (−0.56) | |
| *Loan Maturity* | -0.2257 | |
| | (−1.41) | |
| *Collateral* | 0.5267*** | |
| | (3.08) | |
| *Syndicate* | 1.7330*** | |
| | (4.01) | |
| *Term Spread* | -0.1873 | |
| | (−1.09) | |
| *Credit Spread* | 0.3133 | |
| | (1.14) | |
| *Constant* | -3.4079*** | 0.0373 |
| | (−2.60) | (1.32) |
| *Control for* | | |
| *Loan purpose* | Yes | No |
| *Loan type* | Yes | No |
| *Rating* | Yes | No |
| *Industry FE* | Yes | Yes |
| *Year FE* | Yes | Yes |
| *Pseudo* $R^2$ | 0.2643 | |
| *Adj.* $R^2$ | | 0.3039 |
| *Obs.* | 19,395 | 6022 |

Column (1) presents the logistic regression results for the bank safety-oriented culture on the defaults of borrowers. The empirical model is:

$$\Pr\left(\text{Default}_{j,t+n} = 1\left(\text{Bank Culture}_{i,1998}, \text{FIRM}_{j,t-1}, Z_{i,t}\right) = L(\alpha 0 + \alpha 1\text{Bank Culture}_{i,1998} + \beta'\text{BANKi}, -1 + \gamma'\text{FIRMj}, t-1 + \theta'\text{Zi}, t + \text{vj} + \mu t\right)$$

where $Default_{j,t+n}$ is the dummy variable that equals one if the borrower has a default in the future. Column (2) presents the results of the OLS for the bank safety-oriented culture on the cumulative abnormal return of lenders and borrowers. The empirical model is:

$$\text{CAR} = \alpha 0 + \alpha 1\text{Bank Culture}_{i,1998} + \beta'\text{BANKi}, -1 + \gamma'\text{FIRMj}, t-1 + \theta'\text{Zi}, t + \text{vj} + \mu t + \varepsilon j, t$$

where *CAR* is the cumulative abnormal return of the loan announcement. *CAR_total* is the cumulative abnormal return from the Carhart four-factor model for the 10-day window [− 5;5] of lenders and borrowers(value-weight by firm size) on a date *t*. $Bank\ Culture_{i,1998}$ is a measure that represents the unobservable culture of bank *i*. $BANK_{i,t-1}$ is a vector of risk-taking characteristics for bank *i* in year *t* –1, $FIRM_{j,t-1}$ is a vector of control variables for firm *i* in year *t*–1, $Z_{I,t}$ is the vector of the control variables for loan and macroeconomic factors in year *t*, $\nu_j$ and $\pi_t$ are the industry and year fixed effects respectively, and $\varepsilon_{j,t}$ is the random error. The variable definitions are in Appendix A. In all the equations, we report *t*-values based on standard errors adjusted for heteroskedasticity and sample clustering at the bank level (White, 1980; Petersen, 2009). The superscripts * , * *, and * ** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

In sum, the results from Table 10 support the idea that banks with a safety-oriented culture not only suffer fewer defaults from their loan contracts with borrowers but also have higher market responses around loan announcements. These findings support H4 and H5 that banks with a safety-oriented culture have both better lending quality and better market response to their loan contract. In addition, these results confirm that banks with a safety-oriented culture can better control the risks in their lending decisions and create additional market value. Also, our findings reject the alternative hypothesis that banks with a safety-oriented culture only accept less risky lending due to their conservative risk attitude, thus destroying market value for banks.

### 5.6. Robustness checks

We also conduct two additional robustness checks to confirm our hypotheses. First, Song and Thakor (2019) suggest a CEO-bank matching mechanism in their risk attitude, which means that CEOs play an important role in banks' decisions and risk taking. So we add some control variables of bank CEO characteristics and bank governance in loan-level regression. Following Core and Guay (2002), *DELTA* is the dollar change in portfolio value for a 0.01 change in the annualized standard deviation of stock returns, and we use the natural logarithm of the value; *VEGA* is the dollar change in portfolio value for a 1 % change in the stock price. *CEOholding* is the percentage of deltas of shares and stock options held by a CEO as a fraction of the total delta associated with all outstanding; *Board size* is the number of directors on the firm's board; *INDEPENDENT* is the number of independent directors divided by the board size; *Duality* is an indicator variable that equals one if the CEO is the chairman of the board, and zero otherwise. These are among the most commonly used variables related to the CEO and corporate governance. The empirical results are presented in Ppanel A of Table 11. The main results continue to hold after dropping around 25 % of the sample.

Second, since Ho et al. (2016) argue that the overconfidence of bank managers would affect banks in several ways, we further control for managerial overconfidence in our sample. CEO overconfidence is a dummy variable that equals one if a bank has a CEO postpones exercising his options when the option is in-the-money more than 67 % (Hirshleifer et al., 2012) and zero otherwise. As shown in Panel B of Table 11, our results are still robust after controlling for CEO overconfidence.

## 6. Conclusion

Some studies describe a culture as the managers' perceptions that coworkers share similar beliefs in risk-taking. A number of studies also define culture in terms of a focus on behaviors relevant to risk-taking. Based on the theoretical model of Song and Thakor (2019), which show that bank culture can reflect in the source distribution choice between growth and safety, this study proposes a new measure that represents the safety-oriented culture that results from their business model. We regress several risk-taking characteristics as documented in Fahlenbrach et al. (2012) on bank stock performance around the 1998 LTCM crisis and obtain a risk-driven component and residual component. Suppose that banks make a choice between growth that involves risk-taking and safety that pursues less risk, we use the residual component to represent the safety-oriented culture. Furthermore, we provide several validation tests during the subsequent financial crisis to confirm that our measure can capture the safety-oriented culture of banks.

Our empirical results show that banks with a safety-oriented culture increase their probability of signing a contract with low-risk borrowers over the sample period. That is, we find that banks with a safety-oriented culture select high-quality borrowers who have lower credit and crash risks. Second, the evidence shows that banks with a safety-oriented culture charge lower loan spread for their high-quality borrowers.

**Table 11**
Robustness checks.

Panel A: control for CEO characteristics and bank governance

| | *Spread* | *Totalcov* | *Fincov* | *Gencov* |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| *Bank Culture* | -0.1835*** | 1.2362** | 0.0707 | 1.1656*** |
| | (−2.66) | (2.13) | (0.43) | (2.68) |
| *DELTA* | -0.0022 | 0.1252* | 0.0282 | 0.0970* |
| | (−0.31) | (1.88) | (1.46) | (1.95) |
| *VEGA* | 0.0018 | 0.0018 | 0.0032 | -0.0014 |
| | (0.37) | (0.04) | (0.23) | (−0.04) |
| *CEOholding* | 0.0008 | -0.0342 | -0.0060 | -0.0282 |
| | (0.22) | (−1.22) | (−0.68) | (−1.39) |
| *Board size* | -0.0042 | -0.0092 | 0.0026 | -0.0118 |
| | (−1.44) | (−0.34) | (0.34) | (−0.58) |
| *INDEPENDT* | -0.4075* | -0.3264 | -0.1119 | -0.2145 |
| | (−1.91) | (−0.17) | (−0.21) | (−0.15) |
| *Duality* | -0.0063 | 0.2259 | 0.0029 | 0.2230 |
| | (−0.25) | (1.07) | (0.05) | (1.41) |
| *Constant* | 6.7905*** | 0.8550 | 1.1191** | -0.2641 |
| | (31.65) | (0.45) | (2.03) | (−0.18) |
| *Control for* | | | | |
| *Control variables* | Yes | Yes | Yes | Yes |
| *Loan purpose* | Yes | Yes | Yes | Yes |
| *Loan type* | Yes | Yes | Yes | Yes |
| *Rating* | Yes | Yes | Yes | Yes |
| *Industry FE* | Yes | Yes | Yes | Yes |
| *Year FE* | Yes | Yes | Yes | Yes |
| *Adj. R-squared* | 0.6623 | 0.2983 | 0.2741 | 0.2972 |
| *Obs.* | 15,248 | 15,663 | 15,663 | 15,663 |

Panel B: control for CEO overconfidence

| | OLS | | | | | | | | Logit |
|---|---|---|---|---|---|---|---|---|---|
| | *Z-score* | *EDF* | *NCSKEW* | *DUVOL* | *Spread* | *Totalcov* | *Fincov* | *Gencov* | *Default* |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| *Bank Culture* | 0.7973*** | -0.0413** | -0.6827** | -0.3929** | -0.1621** | 0.7662** | 0.0211 | 0.7451* | -2.0163** |
| | (3.42) | (−2.12) | (−2.42) | (−2.49) | (−2.49) | (2.15) | (0.21) | (1.83) | (−2.09) |
| *OC* | 0.1050* | -0.0005 | -0.0354 | -0.0360 | 0.0208 | -0.1245 | -0.0480 | -0.0765 | 0.0728 |
| | (1.90) | (−0.10) | (−0.57) | (−1.03) | (1.20) | (−1.20) | (−1.57) | (−0.72) | (0.27) |
| *Constant* | 1.3188** | 0.0209 | -1.2606 | -0.6931 | 6.0011*** | -1.7859* | 0.4070 | -2.1929** | -1.3722 |
| | (2.44) | (0.42) | (−1.41) | (−1.40) | (39.09) | (−1.91) | (1.46) | (−2.21) | (−0.49) |
| *Control for* | | | | | | | | | |
| *Control variables* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Loan purpose* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Loan type* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Rating* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Industry FE* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Year FE* | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| *Adj. R-squared* | 0.5845 | 0.3549 | 0.2580 | 0.2585 | 0.6730 | 0.3281 | 0.2855 | 0.3309 | |
| *Pseudo R2* | | | | | | | | | 0.3433 |
| *Obs.* | 11,498 | 9476 | 8879 | 8879 | 10,700 | 10,995 | 10,995 | 10,995 | 6564 |

This table presents the robustness checks. Panel A shows the results of bank safety-oriented culture on the loan-level variable after additionally controlling for CEO characteristics and bank governance. Panel B shows the results of bank safety-oriented culture on the loan-level variable after additionally controlling for CEO overconfidence. The empirical model is similar as before. CEO characteristics including *DELTA, VEGA*, and *CEOholding*. Bank governace including *Board size*, *INDEPENDENT*, and *Duality*. CEO overconfience(*OC*) is a dummy variable that equals 1 if a bank has a CEO postpones exercising his options when the option is in-the-money more than 67 % (Hirshleifer et al. 2012). The variable definitions are in Appendix A. In all the equations, we report *t*-values based on standard errors adjusted for heteroskedasticity and sample clustering at the bank level (White, 1980; Petersen, 2009). The superscripts * , * *, and * ** denote significance at the 10 %, 5 %, and 1 % levels, respectively.

Third, we also find that these banks ask for more loan covenants to protect their creditor's rights. Fourth, we find that they are less likely to suffer borrower defaults in the future, which supports the idea that their customers are true of higher quality. Fifth, our results show that the lending decisions made by banks with a safety-oriented culture get a better market response. Last, we use mergers and acquisitions as exogenous shocks and find that an improvement in bank culture can lead to less risky borrowers in subsequent lending decisions.

In sum, this paper uses a new measure to proxy for implicit bank culture. We use this measure to explain why a bank may have a similar performance during different crises by focusing on the effects of bank culture on lending choice. The evidence shows that banks with a safety-oriented culture have relatively better lending quality and market responses. Namely, banks with a safety-oriented culture have better risk control in their lending, thus creating market value for banks.

## Data availability

The authors do not have permission to share data.

## Appendix A. Variable definition

| | Definition | Data source |
|---|---|---|
| **PanelA: Bank culture variable** | | |
| *Bank Culture* | It is a measure that represents the safety-oriented culture of banks. We regress several risk-taking characteristics as documented in Fahlenbrach et al. (2012) on the returns during the 1998 LTCM crisis and obtain a residual component to represent the safety-oriented culture of a bank. | Authors |
| **Panel B: Lender characteristics** | | |
| *L_Asset* | Natural logarithm of total assets of the banks in US$ billion. | Compustat Bank (CB) |
| *L_ Leverage* | Ratio of assets to book value of equity. | (CB) |
| *L_ROA* | Ratio of net income to total assets. | (CB) |
| *L_Tier 1* | Tier 1 capital ratio is the ratio of a bank's core equity capital to its total risk-weighted assets, which is calculated according to the Basel Accord for reporting risk-adjusted capital adequacy | (CB) |
| *Bank Z-score* | (ROA+Capital Asset raito)/Standard Deviation(ROA) | (CB) |
| *ROA_SD* | The standard deviation of ROA, which is estimated using ROA in the next five years. | (CB) |
| *RET_SD* | The standard deviation of return, which is estimated using return in the given year. | (CB) |
| *Asset growth* | The increase in assets of this year compared to the previous year. | (CB) |
| *OC* | A dummy variable that equals 1 if a bank has a CEO postpones exercising his options when the option is in-the-money more than 67 % (Hirshleifer et al., 2012). | ExecuComp |
| **Panel C: Loan characteristics** | | |
| *Spread* | Natural logarithm of loan spread. Loan spread is measured as the all-in spread drawn from the DealScan database. The all-in spread drawn is defined as the amount the borrower pays in basis points over LIBOR or the LIBOR equivalent for each dollar drawn down. | DealScan |
| *Loan Size* | The natural logarithm of the amount of the loan in US$ million. | DealScan |
| *Loan Maturity* | The natural logarithm of loan maturity in months. | DealScan |
| *Collateral* | A dummy variable that equals one if a loan is secured and zero otherwise. | DealScan |
| *Syndicate* | A dummy variable that equals one if a loan is syndicated and zero otherwise. | DealScan |
| *Gencov* | Number of general covenants | DealScan |
| *Fincov* | Number of financial covenants | DealScan |
| *Totalcov* | Number of total covenants | DealScan |
| *Loan type* | Dummy variable for loan types: term loan, revolver greater than one year, revolver less than one year, and the 364-day facility. | DealScan |
| *Loan purpose* | Dummy variable for loan purposes such as corporate purposes, debt repayment, working capital, and takeover. | DealScan |
| *Loan growth* | The increase in loansize of this year compared to the previous year. | DealScan |
| **Panel D: Borrower Characteristics** | | |
| *Asset* | The natural logarithm of total assets of the firms in US$ million. | Compustat |
| *Leverage* | Book value of assets minus book value of equity plus market value of equity divided by market value of equity. | Compustat |
| *BM* | Book value of common equity divided by market value of common equity | Compustat |
| *Profitability* | The earnings before interest, taxes, depreciation and amortization divided by total assets. | Compustat |
| *Tangibility* | Net property, plant,and equipment divided by total assets. | Compustat |
| *Z-score* | Modified Altman's Z-score (1.2 × working capital + 1.4 × retained earnings + 3.3 × EBIT+ 0.999 × sales)/ total assets. | Compustat |
| *Rating* | Standard & Poor's senior debt rating, converted into an index from zero to ten as follows: 10 = AAA, 9 = AA, 8 = A, 7 = BBB, 6 = BB, 5 = B, 4 = CCC, 3 = CC, 2 = C, 1 = D, and 0 = no rating. | Compustat |
| **Panel E: Macroeconomics factors** | | |
| *Credit Spread* | The difference between the AAA corporate bond yield and the BAA corporate bond yield. | Datastream |
| *Term Spread* | The difference between the 10-year Treasury yield and the 2-year Treasury yield. | Datastream |
| **Panel F: Credit and crash Risks of borrowers** | | |
| *EDF* | The EDF is the percentile ranking of a firm's default risk based on its distance to default (constructed from Bharath and Shumway, 2008). | Compustat |
| *NCSKEW* | Following Chenet al. (2001), NCSKEW is negative of the third moment of firm-specific weekly returns in a year and is normalized by the standard deviation of firm-specific weekly returns raised to the third power. | CRSP |
| *DUVOL* | Following Chenet al. (2001), the log of the ratio of the standard deviation of firm-specific weekly returns for down weeks to the standard deviation of firm-specific weekly returns for up weeks. Down weeks as all the weeks with firm-specific weekly returns below the annual mean and up weeks as those with firm-specific returns above the annual mean. | CRSP |
| *Default* | A dummy variable that equals one if the borrower has a default in the future. The defaults are obtained from Moody's analytics default and recovery database that records a firm's defaults such as distressed exchange, dividend omission, interest default, Chapter 11, or Chapter 7…etc. | Moody's default database |
| **Panel G: Loan announcement returns** | | |
| *CAR[− 5,5]* | Sum of abnormal returns for the announcement windows from five days before the announcement to five following days | CRSP & DealScan |
| **Panel H: Variables of Validation tests** | | |
| *Crisis return (RE08)* | The annualized buy-and-hold returns from July 1, 2007, through December 31, 2008. | CRSP |

(*continued on next page*)

(*continued*)

| | Definition | Data source |
|---|---|---|
| *LTCM crisis return* | Following (Fahlenbrach et al., 2012), *LTCM crisis return* is the annualized buy-and-hold returns from August 3, 1998, until the day in 1998 on which the bank's stock attains its lowest price. If the lowest price occurs more than once, then the return is calculated using the first date on which it occurs. | CRSP |
| *ΔEDF* | Change in expected default frequency between crisis years (2007–2008) and year 2006. The EDF is the percentile ranking of a firm's default risk based on its distance to default (constructed from Bharath and Shumway, 2008) | Compustat and CRSP |
| *ΔNPL* | Change in ratio of nonperforming loans to total gross loans between crisis years (2007–2008) and year 2006. Nonperforming loans are defined as loans with interest payments and principal more than 90 days overdue | Compustat |
| *STFunding* | Debt in current liabilities divided by total liabilities | Compustat and CRSP |
| *AssetG* | Annualized growth rate of total assets during previous three-year data | Compustat |
| *BHAR0607* | Buy-and-hold returns from July 1, 2006, through June 30, 2007 | CRSP |
| *BM* | Book value of common equity divided by market value of common equity | Compustat |
| *TCE* | Tangible common equity ratio: tangible common equity divided by tangible assets and multiplied by 100 | Compustat |
| *Beta* | Banks' equity beta from a market model of daily returns in excess of 3-month T-bills that uses the previous two-year data, where the market is represented by the value-weighted CRSP index | Compustat |
| *GAI* | General managerial ability index | Custódioet al. (2013) |
| *DELTA* | Dollar change in portfolio value for a 0.01 change in the annualized standard deviation of stock returns (Core and Guay (2002)) | ExecuComp. |
| *VEGA* | Dollar change in portfolio value for a 1 % change in the stock price (Core and Guay (2002)) | ExecuComp. |
| *TOTALPAY* | *TOTALPAY* includes salary, bonus, stock awards, option awards, long-term incentive plans, and other annual compensation such as perquisites and other personal benefits. | Execu-Comp. |
| *CEOholding* | The percentage of deltas of shares and stock options held by a CEO as a fraction of the total delta associated with all outstanding | Execu-Comp. |
| *G-index* | Governance indices | RiskMetrics |
| *GOV41* | The 41 individual attributes of a firm in four categories (i.e., board, audit, anti-takeover provisions, and compensation-ownership) | Aggarwal et al. (2011) |
| *INDEPENDT* | The percentage of outside directors | RiskMetrics |

## Appendix B. Summary statistics of the variables in validation test

The table presents the summary statistics for the variables used in the validation test. The variable definitions are in the Appendix A.

| Variable | (1) Mean | (2) Std. Dev. | (3) Centile | (4) | (5) |
|---|---|---|---|---|---|
| | | | P25 | P50 | P75 |
| Panel A: Validation test | | | | | |
| *Bank Culture* | 0.0178 | 0.1964 | -0.1371 | 0.0371 | 0.1272 |
| *RE08* | -0.3336 | 0.3120 | -0.5406 | -0.3377 | -0.1495 |
| *ΔEDF* | 0.3985 | 0.4098 | 0.0077 | 0.2823 | 0.8552 |
| *ΔNPL* | 0.0357 | 0.0446 | 0.0084 | 0.0214 | 0.0448 |
| *Leverage* | 5.7413 | 4.6583 | 1.8899 | 5.1943 | 9.0018 |
| *STFunding* | 0.0857 | 0.1092 | 0.0054 | 0.0534 | 0.1426 |
| *AssetG* | 0.4750 | 0.8625 | 0.1543 | 0.3379 | 0.5460 |
| *BHAR0607* | 0.0920 | 0.4310 | -0.0928 | 0.0411 | 0.2122 |
| *Asset* | 8.2602 | 2.8682 | 6.6105 | 7.9253 | 9.7824 |
| *BM* | 0.5109 | 0.4904 | 0.3699 | 0.4703 | 0.6867 |
| *TCE* | 13.0926 | 104.1623 | 4.7176 | 7.8020 | 25.6825 |
| *Beta* | 0.6559 | 0.4347 | 0.3595 | 0.6305 | 0.9481 |
| *IDIORISK* | 1.6439 | 0.9355 | 1.0378 | 1.4181 | 1.8688 |
| *MES* | -0.0108 | 0.0071 | -0.0154 | -0.0106 | -0.0071 |
| *GAI* | -0.1839 | 0.9636 | -0.9230 | -0.4343 | 0.4602 |
| *DELTA* | 5.4943 | 1.6875 | 4.3607 | 5.5448 | 6.4967 |
| *VEGA* | 3.6549 | 1.7292 | 2.4795 | 3.8462 | 4.9138 |
| *TOTALPAY* | 1090.0960 | 1333.0560 | 590.0000 | 828.4620 | 1000.0000 |
| *CEOholding* | 2.8914 | 6.4465 | 0.0000 | 0.3700 | 2.2100 |
| *Gindex* | 9.5545 | 2.9788 | 7.7500 | 10.0000 | 12.0000 |
| *GOV41* | 0.6749 | 0.0861 | 0.6341 | 0.6829 | 0.7317 |
| *INDEPENDT* | 0.6931 | 0.1677 | 0.6038 | 0.7143 | 0.8136 |

## Appendix C. Correlation matrix

This table presents the Pearson correlation matrix between the variables used in Table 8. The sample period is from 1999 to 2017. The * , * * and * ** denote significance levels at 10 %, 5 % and 1 %, respectively.

| Variables | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) *Bank Culture* | 1.000 | | | | | | | | | | | | | | | | | |
| (2) *L_Asset* | -0.175* | 1.000 | | | | | | | | | | | | | | | | |
| (3) *L_Leverage* | -0.501* | 0.182* | 1.000 | | | | | | | | | | | | | | | |
| (4) *L_ROA* | 0.354* | -0.431* | -0.509* | 1.000 | | | | | | | | | | | | | | |
| (5) *L_Tier1* | -0.317* | 0.366* | -0.061* | -0.469* | 1.000 | | | | | | | | | | | | | |
| (6) *Assets* | -0.173* | 0.363* | 0.228* | -0.302* | 0.241* | 1.000 | | | | | | | | | | | | |
| (7) *MB* | -0.008 | -0.010 | -0.050* | 0.011 | 0.028* | -0.156* | 1.000 | | | | | | | | | | | |
| (8) *Leverage* | -0.012 | 0.072* | 0.031* | -0.055* | 0.039* | 0.058* | -0.133* | 1.000 | | | | | | | | | | |
| (9) *Profitablity* | 0.066* | 0.096* | -0.038* | -0.017* | -0.005 | -0.104* | 0.477* | -0.011 | 1.000 | | | | | | | | | |
| (10) *Tangibility* | 0.021* | 0.019* | 0.035* | 0.010 | -0.034* | 0.051* | -0.107* | 0.187* | 0.097* | 1.000 | | | | | | | | |
| (11) *Z-score* | 0.153* | 0.064* | -0.093* | 0.065* | -0.098* | -0.064* | 0.162* | -0.351* | 0.519* | -0.183* | 1.000 | | | | | | | |
| (12) *Spread* | -0.073* | -0.048* | -0.121* | -0.090* | 0.258* | -0.370* | -0.141* | 0.220* | -0.138* | -0.062* | -0.204* | 1.000 | | | | | | |
| (13) *Loan Size* | -0.137* | 0.411* | 0.093* | -0.279* | 0.314* | 0.643* | 0.021* | 0.080* | 0.126* | 0.099* | 0.039* | -0.321* | 1.000 | | | | | |
| (14) *Loan Maturity* | -0.060* | 0.183* | -0.027* | -0.144* | 0.241* | 0.001 | 0.008 | 0.082* | 0.100* | -0.003 | 0.016* | 0.209* | 0.146* | 1.000 | | | | |
| (15) *Collateral* | -0.011 | -0.066* | -0.063* | 0.006 | 0.029* | -0.375* | -0.047* | 0.162* | -0.053* | -0.077* | -0.106* | 0.513* | -0.255* | 0.205* | 1.000 | | | |
| (16) *Syndicate* | 0.057* | 0.101* | -0.156* | 0.010 | 0.092* | -0.066* | 0.028* | 0.050* | 0.117* | 0.058* | 0.077* | 0.042* | 0.169* | 0.103* | 0.042* | 1.000 | | |
| (17) *Term spread* | -0.126* | 0.146* | -0.069* | -0.176* | 0.457* | 0.112* | -0.073* | 0.022* | -0.019* | 0.006 | -0.054* | 0.239* | 0.119* | 0.043* | 0.024* | 0.023* | 1.000 | |
| (18) *Credit spread* | 0.033* | -0.043* | -0.042* | 0.200* | -0.075* | -0.028* | 0.015 | 0.024* | 0.007 | 0.001 | 0.009 | -0.111* | 0.013 | 0.119* | 0.011 | 0.004 | -0.169* | 1.000 |

## Appendix D. Bank safety-oriented culture ranking

This table shows how banks rank in terms of their safety-oriented culture scores, from highest to lowest.

| Order | Company Name |
|---|---|
| 1 | WESTPAC BANKING |
| 2 | AMSOUTH BANCORPORATION |
| 3 | PNC FINANCIAL SVCS GROUP INC |
| 4 | BANK ONE CORP |
| 5 | NATIONAL CITY CORP |
| 6 | WACHOVIA CORP |
| 7 | MELLON FINANCIAL CORP |
| 8 | COMERICA INC |
| 9 | KEYCORP |
| 10 | TRUSTMARK CORP |
| 11 | CITY NATIONAL CORP |
| 12 | TORONTO DOMINION BANK |
| 13 | REGIONS FINANCIAL CORP |
| 14 | BEAR STEARNS COMPANIES INC |
| 15 | HIBERNIA CORP CL A |
| 16 | WELLS FARGO & CO |
| 17 | BANK OF AMERICA CORP |
| 18 | STIFEL FINANCIAL CORP |
| 19 | WEBSTER FINANCIAL CORP |
| 20 | SUNTRUST BANKS INC |
| 21 | LEHMAN BROTHERS HOLDINGS INC |
| 22 | CAPITAL ONE FINANCIAL CORP |
| 23 | FIFTH THIRD BANCORP |
| 24 | SYNOVUS FINANCIAL CORP |
| 25 | BANKBOSTON CORP |
| 26 | BANCWEST CORP |
| 27 | PEOPLE'S UNITED FINL INC |
| 28 | U S BANCORP |
| 29 | NORTHERN TRUST CORP |
| 30 | BARCLAYS PLC |
| 31 | BANK OF HAWAII CORP |
| 32 | ROYAL BANK OF CANADA |
| 33 | FLEETBOSTON FINANCIAL CORP |
| 34 | BANCO SANTANDER SA |
| 35 | ZIONS BANCORPORATION NA |
| 36 | BBVA |
| 37 | BANK OF MONTREAL |
| 38 | NATL WESTMINSTER BANK |
| 39 | M & T BANK CORP |
| 40 | SVB FINANCIAL GROUP |

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