Institutional Investor Horizon and Bank Risk-taking

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Abstract

We test the effect of short-term versus long-term institutional shareholding –so-called investor horizon– on bank risk-taking. We find that in contrast to banks dominated by short-term shareholders, banks with greater long-term shareholding are associated with lower risk, better stock performance, and conservative business and compensation policies. Our results imply that bank regulators should be more vigilant over the actions of banks that heavily rely on short-term shareholding.

JEL classification: G21, G32, G35, J33
Key words: bank risk-taking; institutional shareholdings, financial crisis; financial performance

1. Introduction

In recent times, pension and mutual funds (typifying a long-term investor focus), along with hedge funds (typifying a more short-term focus) have become more active investors. The change in the mix of shareholdings toward activism and the growing engagement of long-term shareholders with their investee boards has attracted attention across many quarters – including, media, the public, and academics. In this regard, several existing studies highlight the differential roles taken by short vs. long-term investors on corporate policy and governance decisions.[1] But critical questions remain unanswered. One such question is how shareholders' differential monitoring incentives impact firm risk-taking. Our goal is to address a piece of this question, by investigating the banking industry.

Examining the impact of investor horizon on risk-taking in the banking industry is important for several reasons. First, regulatory reforms made in response to the banking crisis of 2007-2009 aimed to improve bank governance by empowering shareholders to more closely monitor bank managers. Emerging banking literature, however, suggests that banks with more "shareholder-friendly" governance – for instance, more independent directors and better-aligned pay incentives – take higher risks and perform worse during crises.[2] Thus, an important blind spot exists in our knowledge base of what constitutes effective bank governance – governance that can improve long-term financial stability. To gain key insights into this knowledge gap, we study the relation between investor horizon and bank risk-taking.

Second, the banking sector offers an appealing laboratory for studying firm risk-taking and its consequences. Shareholder pressure on banks to boost their short-term profits by excessive risk-taking contributed to the 2007–2009 financial crisis (e.g., Dallas 2012; Bair 2011). Shareholders of banks have

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[1] For example, short-term shareholders are associated with higher information asymmetry (Burns, Kedia, and Lipson 2010); larger bond yield spread (Huang and Petkevich 2016); greater litigation risk (Pukthuanthong, Turtle, Walker, and Wang 2017); lower research and development expenditures, higher leverage and payout (Cremers, Pareek, and Sautner 2020); lower bank financing (Brandon, Fu, and Tang 2020) but better price support during downturns (Cheng, Huang, and Luo 2020); greater innovation efficiency (Brav, Jiang, Ma, and Tian 2018), and lower credit spread (Switzer and Wang 2017). Conversely, long-term shareholders improve monitoring, innovation efficiency, corporate social responsibility, financial reporting quality and firm performance (e.g., Boone and White 2015; Nofsinger, Sulaeman, and Varma 2019; Nguyen et al. 2020; Harford, Kecskés, and Mansi 2018); decreased stock price synchronicity, crash risk (An and Zhang 2013; Callen and Fang 2013); and less insider trading (Fu, Kong, Tang, and Yan 2020).

[2] See recently, for example, Bekkum (2016), Boyallian and Ruiz-Verdú (2018), and Leung, Song, and Chen (2019).

atypical incentives and opportunities to benefit from greater risk-taking because they encounter a bank-specific form of moral hazard from limited liability, high financial leverage, absence of insured depositor discipline, opaque bank assets, and government support (in the implicit "too-big-to-fail" policy) (Jensen and Meckling 1976; Morgan 2002).

Third, compared to non-financial firms, banks are more opaque due to the complex nature of their business, the possession of their clients' private information and bank assets that are mainly financial (Morgan 2002). This opacity in banks provides opportunities for distorted behavior.[3] Therefore, it is essential to identify the type of shareholders that could potentially be a delegated monitor in such an opaque bank environment.

It is not clear, *a priori*, that institutional investor horizon affects bank outcomes in the same way that it affects non-financial firms, for two key reasons. First, unlike other sectors, the banking sector is strictly regulated by multiple agencies such as Federal Reserve System, Federal Deposit Insurance Corporation (FDIC), which could potentially work against empirically detecting a significant relation between shareholder horizon and bank risk.[4] Second, while bank shareholders have unique moral hazard problems to benefit from excessive bank risk-taking, banks have other significant stakeholders, such as depositors, creditors, and the government, who have strong incentives to curb excessive risk-taking. Given such conflicting forces on bank risk-taking, it is an open question whether and to what extent, and more importantly, through what mechanisms institutional investor horizon influence bank risk-taking.

Existing studies generally describe short-term (hereafter, ST) shareholders as less motivated monitors, since they usually engage in trading to generate immediate profit (e.g., Kahn and Winton 1998; Maug 1998). They encourage managerial myopia (Bolton, Scheinkman, and Xiong 2006; Bushee 1998; Stein 1989). In turn, we propose that ST bank shareholders lack incentive to maintain bank stability due to the ST nature of their investment, and the bank-specific moral hazard as noted earlier. Conversely, a

[3] For instance, as loan qualities are not observable, banks can conceal true loan-qualities by way of extending more loans to already defaulted clients.

[4] Banks are more intensely regulated to avoid negative externalities from any "systemic risk" (Flannery 1998) and to protect the interest of "dispersed" and "unsophisticated" bank depositors.

growing body of literature on shareholder activism labels long-term shareholders as more motivated monitors, capable of containing managerial myopia (e.g., An and Zhang 2013; Appel et al. 2016; Brandon et al. 2020; Elyasiani and Jia 2008; Fu et al. 2020; Nguyen et al. 2020; Harford et al. 2018). Firms with greater LT shareholdings are associated with more independent directors, removal of takeover defenses, and shareholder voting rights that are more equal (Appel et al. 2016). Therefore, we expect LT bank shareholders are less vulnerable to moral hazard and possess the ability and motivation to reduce risk-taking to realize long-term bank value.

Identifying ST versus LT shareholders based on their portfolio churn ratio (e.g., Gaspar et al. 2005; Garel and Petit-Romec 2017; Harford et al. 2018), we disentangle how ST and LT shareholders affect bank risk. We test our conjectures using an unbalanced panel of 5,791 bank-year observations for 833 U.S. bank holding companies from 1991 through 2013, and our analysis reveals several important relations. First, we find strong evidence that bank risk-taking increases by up to 15% with ST shareholdings, while it decreases by up to 6% with LT shareholdings. These results are economically meaningful and are robust to: a wide variety of alternative risk measures, alternative constructions of investor horizon, and instrumental variable estimation. We conclude that not all bank shareholders are enticed to take excessive risk and the moral hazard bias in banks is not widespread, affecting shareholders differently.

One might logically anticipate that banks with high ST shareholdings generate better financial returns for taking higher risks and vice-versa for LT shareholdings. However, we find the opposite – worse (better) stock performance for banks with high ST (LT) shareholdings. In addition, our cross-sectional analysis shows that in contrast to LT shareholdings, banks with greater ST shareholdings in 2006 experienced more risk and did not perform well during the 2007–2009 crisis. These results suggest that high ST shareholdings do not just result in more aggressive bank risk-taking but also worse bank performance and, hence, they do not appear to be conducive to a prudent bank business model.

We evaluate investment, financing, business model, and loan-monitoring quality as potential mechanisms through which banks embrace risk and such analyses bolster our claims of causal inference. We observe that banks with high ST shareholdings make aggressive investment decisions (i.e., about 40%

higher private mortgage-backed securities), aggressive financing choices (i.e., around 3% less core deposit funding), adopt a more transaction-based business model (i.e., 18% higher derivative trading activities), and poorly monitor their loans portfolio (i.e., almost 10% higher non-performing loans). Conversely, banks with greater LT shareholdings make conservative financing decisions (i.e., about 3% more core deposit funding), follow a more traditional business model (i.e., around 5% less derivative trading activities), and conduct superior loan monitoring (i.e., approximately 10% less non-performing loans).

We also test how ST and LT shareholdings relate to managerial incentives, because some bank studies have linked equity-based pay to the bank risk-taking that resulted in the financial crisis (e.g., Cheng et al. 2015; Fahlenbrach and Stulz 2011). Our analysis shows that, indeed, CEOs in banks with higher ST shareholdings receive more equity-based pay (i.e., 1.4% higher pay in stocks, or 2.1% greater pay in stocks and options), and experience a 3.5% higher pay-performance sensitivity (delta), and a 2.4% larger pay-risk sensitivity (vega). However, CEOs in banks with greater LT shareholdings have less equity-based pay (i.e., 2.5% lower pay in stocks, or 2.2% less pay in stocks and options), and face a 3.9% lower delta, and a 3.9% lower vega.[5] Overall, these findings indicate that, in contrast to ST shareholders, LT shareholders induce managerial incentives that discourage excessive risk-taking.

Further, we supplement our main findings by investigating how bank competition and shareholder rights affect the association between investor horizon and bank riskiness. We observe that the positive (negative) association between ST (LT) shareholdings and bank risk intensifies (weakens) with heightened competition and weaker governance. These results indicate an unintended consequence of competition as well as a dark-side of empowering shareholders rights in the banking industry. That is, although greater competition reduces bank risk, greater competition also enables bank shareholders to pressure banks to take on more risk. Similarly, greater shareholders rights in banks is associated with higher risk-taking, compatible with the unique bank environment and helps shareholders to pursue banks to attain their own

[5] Each of our four incentive measures (*equity_pay*, *incentive_pay*, *delta*, and *vega*) are annualized. While this ensures a type of consistency of measurement, it is possible that some distortions might inadvertently be induced due to the risk horizon not necessarily coinciding with investor horizons. Accordingly, we caution readers to bear in mind this potential "comparability" concern, when interpreting our results. We thank an anonymous referee for bringing this issue to our attention.

objectives; for example, the positive association between ST shareholdings and bank risk-taking lessens in banks with weaker shareholder rights.

Our study primarily contributes to the literature by augmenting an extensive body of bank risk-taking literature, identifying strong and sizeable differential effects of ST and LT shareholdings on bank risk. Further, we also elaborate on two broad mechanisms that translate into bank risk-taking: business policies and managerial incentives. In this regard, our study is a significant extension of both Garel and Petit-Romec (2017) and Livne et al. (2013), who have shown that ST shareholdings negatively relate to both risk and performance of banks (see the Appendix). Our study is also an extension of Callen and Fang (2013) who document a negative association between institutional shareholder stability and future crash risk of non-bank firms (see the Appendix). Our study is the first to show competition mediates the nature of the association between investor horizon and bank risk.

The remainder of the paper is structured as follows. In section 2, we provide a theoretical background and hypothesis development. In section 3, we present our baseline empirical setting. In section 4, we present and discuss the main empirical results. In section 5, we convey a battery of extended analyses. In section 6, we conclude.

2. Hypothesis development

2.1 Theory of bank risk-taking

As in any corporate firm, due to the "moral hazard" problem with limited liability and the associated "convex pay-off", bank shareholders prefer "excessive risk" (Galai and Masulis 1976; Jensen and Meckling 1976). Galai and Masulis (1976) explain that shareholders effectively hold a "call option" on the firm's value with an exercise price equal to the total amount of debt outstanding. If the interest (deposit) rate is not properly priced to reflect this risk, which is more likely to be the case for banks (due to deposit insurance and regulatory rescue), bank shareholders have an incentive to gain from this call option by increasing the bank's asset risk. "Dispersed" and "unsophisticated" debt-holders, including depositors, cannot prevent bank shareholders from undertaking more risk by initiating "complete" debt contracts on an ex-ante basis because of high information asymmetry (Dewatripont and Tirole 1994). The presence of deposit insurance schemes similar to that of Federal Deposit Insurance Corporation (FDIC) and the perceived "too-big-to-fail" policy also contributes to bank shareholders "moral hazard problems" by encouraging greater bank risk-taking. Using Black and Scholes's (1973) option pricing formulae, Merton (1977) demonstrates that bank shareholders' claims on insurers or guarantors can be thought of as holding a "put option" on the value of bank's assets with an exercise price of depositors' claims.

2.2 Bank risk-taking predictions

We contend that bank risk increases with higher dominance of ST shareholders, because they are not effective monitors (e.g., Bolton et al. 2006, Garel and Petit-Romec 2017; Huang and Petkevich 2016), and the possibility of them benefitting from more risk grows in line with volatility (Galai and Masulis 1976; Jensen and Meckling 1976; Merton 1977). Both the theoretical and empirical literature usually contends that managers in firms with shorter horizon shareholders are pressured to lift ST earnings, even at the cost of long-run fundamental firm value, because ST shareholders would otherwise pressure the board for managerial change, known as "voice" (e.g., Bolton et al. 2006). ST shareholders are also more likely to sell their shares after a stock price drop (Cella et al. 2013). Further, ST shareholders can build pressure on managers even without intervention in the form of a "threat of exit" (Stein 1989). Thus, managers are more likely to cater to ST shareholders, and therefore, incur more risk (Polk and Sapienza 2009). In fact, most managers acknowledge their willingness to sacrifice LT shareholder value to gain ST "alliance" (Graham, Harvey, and Rajgopal 2005). John Bogle, founder of Vanguard, argues that ST shareholders weaken corporate monitoring (Bogle 2009). Hence, we identify the following hypothesis related to ST shareholders:

Hypothesis 1 (H1): Bank risk increases with Short-term shareholding.

Conversely, we argue that bank risk decreases with LT shareholdings for three reasons. First, bank stability would allow LT shareholders to reap LT benefits (Bushman, Hendricks, and Williams 2016). Second, due to their stable shareholdings, LT shareholders often have greater access to information about their portfolio of firms (Porter 1992). Third, LT shareholders typically have large stakes which can improve monitoring (Appel et al. 2016; Fu et al. 2020; Nofsinger et al. 2019; Nguyen et al. 2020), which eventually reduces risk-taking (e.g., An and Zhang 2013; Appel et al. 2016; Callen and Fang 2013; Ellul and Yerramilli 2013; Fu et al., 2020). LT shareholders, like any other shareholders, monitor through both "exit" and "voice," and these two strategies often complement each other (McCahery et al. 2016). Given that more than 90% of US banks are diffusely owned, it follows that LT shareholders play an important role in monitoring bank management (Caprio, Laeven, and Levine 2007; Elyasiani and Jia 2008). In this regard, several recent public interventions, such as activist shareholder Nelson Peltz's call for board representation at the Bank of New York Mellon, provide anecdotal evidence of the interaction between institutional shareholders and bank management.[6] Therefore, we formulate the following hypothesis related to LT shareholders:

Hypothesis 2 (H2): Bank risk decreases with Long-term shareholding.

3. Empirical setting

3.1 Data sources and sample procedure

Our data are annual observations on publicly traded bank holding companies (BHCs) in the United States between 1991 and 2013. We obtain the required information on these banks from three main databases: the Center for Research in Security Prices (CRSP) for market data, the Federal Reserve Bank of Chicago (FRB Chicago) for accounting data, and Thomson Reuters Institutional Holdings (13F) database (formerly CDA/Spectrum) for institutional shareholdings data. FT Russell provides the constituents lists of Russell 2000 indexes as of June 30 each year. We match the stock price data to the financial data for each bank using the PERMCO-RSSD links available from the Federal Reserve Bank of New York. Merging data across all three databases results in an initial sample of 14,049 observations on 1,050 unique banks.

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[6] De la Merced, M. 2014. "Bank of New York Mellon gives board seat to Nelson Peltz's Trian fund". *The New York Times*, December 2 <http://dealbook.nytimes.com/2014/12/02/bank-of-new-york-mellon-gives-board-seat-to-trian-fund/?_r=0>.

Our sample includes banks for which commercial banking is their main business and we identify those commercial banks by requiring that their deposit figures are reported (Berger and Bouwman 2013). To ensure that each institutional shareholder is likely to be influential, our sample is restricted to bank-years where total institutional shareholding is at least 5% of total shares outstanding (Bushee 1998). The main analysis excludes observations in 2007, 2008 and 2009 to avoid contamination from sudden declines in shareholders' portfolio values, intense political and public attention during the financial crisis, which could have altered investors sensitivities to risk and returns.[7] With all these filters, the final sample consists of 5,791 observations across 833 unique banks between 1991 and 2013. These bank-year observations are distributed fairly uniformly across time.[8] The annual frequency with which each bank appears in our data is both right-skewed and right-truncated, indicating the exit of banks via acquisitions or failure during our sample period.

3.2 Measures of bank risk

We use seven different *risk* measures from the previous literature (e.g., Cheng et al. 2015; Ellul and Yerramilli 2013).[9] *Total risk* is the standard deviation of a bank's daily stock returns in each year. *Systematic risk* is the coefficient on market returns (the value-weighted CRSP index including dividends)

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[7] Our main results are robust to including these crisis period observations. See Online Appendix Table OA.4, Panel A.

[8] The sample construction and filtering process is summarized in Panel A of Online Appendix Table OA.1. The Online Appendix Figure OA.1(A) shows the distribution across time, while Figure OA.1(B) presents that the annual frequency with which each bank appears in our data. The Online Appendix Table OA.10 summarizes our main findings across all our untabulated analysis contained in the Online Appendix.

[9] Our choice of these seven risk proxies comes from a careful appreciation of the wide variety of metrics used across this broad literature. While each risk alternative captures a different nuance of the risk banks take, collectively they provide a comprehensive picture that allows us to allay any concerns of missing any major risk dimension. For example, total risk captures the overall variability in bank stock returns and reflects the market's perceptions about the risks inherent in the bank's assets, liabilities, and off-balance-sheet positions. Both regulators and bank managers frequently monitor this total risk. Likewise, the systematic risk is that portion of the bank's total risk, which arises from the covariability in bank equity returns with market returns. Certain types of loans in the bank loan portfolio (such as real estate, commercial and industrial (C&I) and consumer loans) are more sensitive to macro-economic factors compared to other loan types. For instance, C&I loans are the riskiest category of loan in the US and the probability of default of those loans are tightly linked to economic conditions (Gorton and Rosen 1995). Since the bank managers have discretion over the choice of their bank loan portfolio, they may alter the systematic component of the bank's total risk via their loan decisions. The idiosyncratic is that part of total risk arising from the variability in the bank's stock returns due to bank specific factors. It is normally related to the nature of the bank's loan, investment, deposit and capital structure (Anderson and Fraser 2000, p.1387). Although, the relevance of the idiosyncratic risk in stock returns is debatable, several studies find a positive association between idiosyncratic risk and firm-level stock returns (e.g., Goyal and Santa-Clara 2003; Bali, Cakici and Zhang 2005).

from a single-index market model estimated using daily data in each year, and *idiosyncratic risk* is the standard deviation of the residuals from the same market model. *Tail risk* is the marginal expected shortfall, which is the negative of the average return on the bank's stock over the 5% worst return days for the CRSP value-weighted market index in each year. The *inverse Z-score* is the natural log of 1/*Z*, where *Z* is, in a rolling five-year (*t-4* to *t*) estimation window, the average of the bank's annual return on assets (ROA) plus the average of its book value equity-to-assets ratio, divided by the standard deviation of ROA. In addition, we consider two *risk* measures from the Risk Management Institute (RMI) of the National University of Singapore (NUS): *distance-to-default*, and *actuarial spreads*, and these are both computed annually. *Distance-to-default* is derived from the Moody's KMV model: it measures the probability that the bank will default on its debt, where the probability is derived from the price of a call option on the bank's equity (with a strike price equal to the value of the bank's debt obligations).[10] *Actuarial spread* measures a bank's credit risk based on the price (spread) of credit default swaps on its own debt obligations and is specified in terms of its natural log.

3.3 Measures and validation of investor horizon

We use a three-step process to construct the *investor horizon* (i.e., short-term versus long-term shareholdings) measure. First, we calculate the following *churn ratio* for shareholder *i* in the set of companies denoted by Q in their portfolio at quarter *t*:[11]

$$churnratio_{i,t} = \frac{\sum_{j \in Q} \left| n_{j,i,t} p_{j,t} - n_{j,i,t-1} p_{j,t-1} - n_{j,i,t-1} \Delta p_{j,t} \right|}{\sum_{j \in Q} \frac{n_{j,i,t} p_{j,t} + n_{j,i,t-1} p_{j,t-1}}{2}} \tag{1}$$

[10] Duan (2014, 2012) discusses the process of constructing both distance-to-default and actuarial spread in a rolling five-year estimation windows and has made these variables publicly available at <https://www.rmicri.org/en/>.

[11] We compute the churn rate based on every stock in the investors' portfolios rather than the churn rate on their holdings of bank stocks. By computing investor turnover across the entire portfolio, this balances the effect of firm-specific shocks to the investors' holding periods. This measurement rests on the intuitive notion that an LT investor will hold their stock positions for a substantially greater length of time when compared with an ST investor who buys and sells frequently.

where $p_{j,t}$ represents the price of a share in company *j* at quarter *t* and $n_{j,i,t}$ represents the number of shares held by shareholder *i* in company *j* at quarter *t*. To minimize the influence of one quarter with an extreme churn ratio, the average churn rate for each shareholder in each year is computed as a mean of their churn ratios over the past four quarters (see Yan and Zhang 2009). The mean churn ratio of the shareholders who have at some point invested in our sample banks is 0.22, which is considerably lower than the mean churn ratio of 0.35 observed by Cella et al. (2013). This suggests that the investment horizon of shareholders in banks is longer, i.e., on average, shareholders in our sample banks hold their positions for about 14 months (= 12 months/(0.22×4)), whereas shareholders in non-bank firms hold their positions for about 9 months (=12 months/(0.35×4)).

Second, shareholders are then sorted into terciles each quarter based on the average churn rate. We adopt Yan and Zhang's (2009) approach, classifying institutional shareholders as LT if they fall within the bottom tercile, and as ST if they fall within the top tercile. Third, we compute the ST institutional shareholdings as the proportion of total outstanding shares held by ST shareholders, while the LT institutional shareholding is the proportion of total outstanding shares held by LT shareholders. We also use the Bushee (1998) classification of shareholder horizon as a robustness check later.

Our proxies of bank investor horizon possess the necessary properties, as in Derrien et al. (2013), and Harford et al. (2018). First, our proxies of shareholder horizon are persistent at both shareholder and bank levels over our sample period.[12] Notably, there is a significant variation in the churn rates between ST and LT shareholders: the mean churn rate is 0.39 for ST shareholders and 0.08 for LT shareholders, which suggests that on average, ST shareholders in the sample banks hold their positions for about eight months (= 12 months/(0.39×4)), whereas LT shareholders hold their positions for about 38 months (=12 months/(0.08×4)). At the bank level, the mean of either ST or LT institutional shareholding is relatively

[12] At the shareholder level, Figure OA.2(A) indicates that the mean churn rate from equation (1) for both ST and LT shareholders is persistent.

stable, and that LT shareholdings generally remained higher than the ST shareholdings over the period, except during 1996–1998.[13]

3.4 Baseline method and summary statistics

We use the following panel regression method to empirically test our two hypotheses that bank risk increases with ST shareholdings and decreases with LT shareholdings:

$$risk_{i,t} = \alpha_i + \beta' investorhorizon_{i,t-1} + \zeta' X_{i,t-1} + \gamma_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

where *i* indexes banks and *t* indexes time in years, $risk_{i,t}$ is measured using alternative standard measures of bank riskiness, $investorhorizon_{i,t-1}$ is a vector of *st_shareholdings* and *lt_shareholdings* and is lagged one year, and $\mathbf{X}_{i,t-1}$ is a vector of seven lagged control variables that have been used in previous studies on bank risk-taking: bank size (*lnAssets*), loan quality and internal monitoring (*loan loss provisions*), Keeley's Q (*charter value*), revenue mix (*non-interest income*), bank sales growth (*revenue growth*), funding structure (*equity ratio*), and outside monitoring (*institutional shareholding*).[14] Definitions of all these variables are shown in Table 1 and summary statistics are in Table 2. All continuous variables are winsorized at the 1st and 99th percentiles to mitigate the potential effects of outliers. Our model also includes bank fixed-effects (α_i), year fixed-effects (δ_t), and employs heteroscedastic robust standard errors clustered at the bank level ($\varepsilon_{i,t}$).

It is important to note that we follow the convention established in prior studies (e.g., Callen and Fang 2013; DeYoung, Peng, and Yan 2013; Burns et al. 2010; Ellul and Yerramilli 2013; Elyasiani, Jia, and Mao 2010;) to address reverse causality. Specifically, each of our risk proxies as dependent variables

[13] Refer to Figure OA.2(B) in the Online Appendix. In addition, Panels A and B of Online Appendix Table OA.2 reveal that our measure reliably categorizes well-known ST and LT shareholders. For example, our approach classifies Goldman Sachs, Citigroup, Credit Suisse, and Barclays as ST shareholders, and classifies Berkshire Hathaway, Blackrock, Vanguard Group, and Dimensional Fund Advisors as LT shareholders.

[14] See Laeven and Levine (2009), Beltratti and Stulz (2012), DeYoung et al. (2013), and Ellul and Yerramilli (2013).

enter the analysis measured at the end-of-year *t*, while all our explanatory variables including investor horizon proxies enter as at the end of the prior year i.e. at the end-of-year *t−1* (beginning of year *t*). Hence, investor horizon is always predetermined with respect to the risk levels that are observed in year *t*. This lead-lag structure embedded in our model appropriately allows time for the monitoring and incentives established in year *t−1* to influence risk taking measured in year *t*.

From Table 1 of summary statistics, we note that the mean LT shareholdings of 10% is greater than the mean of 7% found by Yan and Zhang (2009) and this suggests LT shareholders increasingly holding more bank shares at least over the past few years. The mean ST shareholdings of 7%, however, is comparable to that of 8% observed by Yan and Zhang (2009) for all firms. The mean for LT indexers' and non-indexers' shareholding is 4% and 7%, respectively. We omit a discussion of the summary statistics of other bank-specific variables here for reasons of brevity.

4. Main empirical results

4.1 Baseline results

Table 3 presents the baseline results of equation (2). The significant and positive coefficient on *st_shareholdings* for six of the seven *risk* proxies strongly suggests that an increase in ST shareholding is associated with an increase in risk. In terms of economic magnitudes, for a hypothetical one-standard deviation increase in the test variable, there is: 2.53% increase in *total risk*, a 4.78% increase in *idiosyncratic risk*, a 10.78% rise in *systematic risk*, a 15.42% increase in *tail risk,* a 3.07% increase in the *ln(inverse Z-score)*, and a 2.95% rise in the probability of insolvency (*distance-to-default*).[15] Notably, these magnitudes are economically important – for example, the size of the influence of ST shareholdings on total risk is comparable to the impact that cash flow rights have on increasing annualised equity volatility (see Laeven

[15] The economic significance associated with each estimate is gauged as the implied change in a given *risk* measure compared to its respective mean value in response to a one standard deviation increases in *st_shareholdings* (i.e., by 0.07 in our sample), or *lt_shareholdings* (i.e., by 0.08 in our sample). For example, the first of our six results stated in the text for *st_shareholdings* is calculated as: [(0.07×0.008)/0.0221] *x* 100 = 2.53%, where 0.07 is the standard deviation of *st_shareholdings*, 0.008 is the estimated regression coefficient on *st_shareholdings*, and 0.0221 is the mean value of *total risk*.

and Levine 2009). Thus, this indicates that the results are statistically and economically significant. Therefore, with regard to hypothesis H1, we document strong support for our contention (based on the argument that short-term shareholders are prone to the moral hazard problem and desire for immediate returns even at the cost of exorbitant risk-taking): greater short-term shareholdings are associated with higher bank *risk*.

Conversely, the estimated coefficient on *lt_shareholdings* is significant and negative for all risk measures except for systematic risk. Economically, the estimates suggest that a one standard deviation increase in LT shareholdings is associated with: a 4.71% reduction in *total risk*, a 5.85% drop in *idiosyncratic risk*, a 3.39% decline in *tail risk*, a 3.47% fall in the *ln(inverse Z-score)*, a 1.42% decrease in the probability of insolvency (*distance-to-default*), and a 1.04% fall in *ln(actuarial spread)*. Thus, with the exception of *systematic risk*, we find strong support for our second hypothesis H2 (based on the argument that long-term shareholders have concern for realizing bank value in the long run, and their ability to improve monitoring): higher LT shareholdings are associated with less bank *risk*.[16]

Despite the above, the results for systematic risk for both *st_shareholdings* and *lt_shareholdings* suggest that bank shareholders in general fail to constrain systematic risk and hence, potentially justify prudential bank regulation (Dewatripont and Tirole 1994). We offer two potential explanations for a positive relation between *lt_shareholdings* and *systematic risk*. First, shareholders of banks in general envision ex ante to benefit from increased deregulation by allowing their banks to profit from increasing risky banking activities such as providing consumer loans, commercial and industrial loans, real-estate loans, and securities business and these loans are directly linked to macro-economic cycles. Consequently, though banks are able to reduce their total risk by way of diversifying their idiosyncratic risk, they expose themselves to market wide systematic risk. Second, LT shareholders who adopt indexing investment strategies, such as ETF investors, could have potentially increased the non-fundamental volatility of daily returns and co-movement of stocks (Ye 2012). Indeed, this view is supported by our later analysis where

[16] All our main results in Table 3 remain robust to first-difference analysis, state fixed-effects, Federal Reserve fixed-effects, balanced sample and to excluding global systematically important banks (GSIBS). See Online Appendix Table OA.9.

we find a significant and positive coefficient on LT indexers for systematic risk (see later, Panel B of Table 9).

The estimated coefficients on control variable vector ***X*** offers several key insights. First, when statistically significant, the coefficients on *ln(assets)*, and *loan loss provision* are positively related to *risk*, while *non-interest income* and *equity* are negatively related to *risk, and* these are economically sensible signs. Second, the positive estimated coefficient on *charter value* is somewhat unexpected; all else equal, banks with larger charter values are expected to involve less risk-taking (Keely 1990). Finally, we have no *a priori* expectations for the sign on *institutional shareholdings*, and *revenue growth*.

4.2 Identification

Investor horizon is unlikely to be exogenous to bank risk-taking, and this is a common perception in the related literature on banks (e.g., DeYoung et al. 2013; Ellul and Yerramilli 2013; Erkens et al. 2012). For example, reverse causality is a distinct possibility; as shareholders likely invest in banks that conform to their risk profiles. Endogeneity problems can also arise from sample selection bias, measurement error and omitted variables. We collectively address such endogeneity issues using seven different empirical design strategies: two-stage least squares instrumental variables (2SLS-IV); active share, propensity score matching (PSM); additional control variables, multiple alternative proxies, sub-sampling analysis and economic channels.

4.2.1 Two-stage least squares instrumental variables (2SLS-IV)

Following prior studies, we use three instruments for *investor horizon* (e.g., Appel et al. 2016; Cremers et al. 2020; Harford et al. 2018; Laeven and Levine 2009). The first instrument is an indicator variable $russell2000_{i,,t-1}$, which takes a value of one if bank *i* is a constituent of the Russell 2000 index in the reconstitution year *t-1*. Index inclusion is shown to be directly related to both *st_shareholdings* and *lt_shareholdings* (Appel et al. 2016; Cremers et al. 2020; Harford et al. 2018) although we have no *a priori* expectation about the direction in which *st_shareholdings* and *lt_shareholdings* will vary with *russell2000*.

The second instrument is the average shareholdings by ST institutional shareholders at all other banks (*industry_st*) which is expected to be positively associated with *st_shareholdings* and negatively with *lt_shareholdings*. The third instrument is the average shareholdings by LT institutional shareholders at all other banks (*industry_lt*) which is anticipated to be negatively associated with *st_shareholdings* and positively with *lt_shareholdings*.

Our 2SLS-IV estimation relies on the assumption that, after conditioning on bank characteristics, the *russell2000*, *industry_st* and *industry_lt* are associated with a significant change in *st_shareholdings* or *lt_shareholdings* (relevance condition) but do not directly affect our risk proxies except through their effect on *st_shareholdings* or *lt_shareholdings* (exclusion condition). We verify the relevance condition in our first-stage estimations as shown in the first two columns of Table 4: coefficients on all three of the instruments are statistically significant with expected signs, and the standard diagnostic tests give us confidence that the model is neither under-identified nor weakly identified. Regarding satisfying the exclusion condition, it is unclear why index inclusion would be directly related to bank risk after robustly controlling for factors that determine index inclusion, such as banks' end-of-May market capitalization. Similarly, the risk of one bank is unlikely to be influenced by changes in the ST or LT shareholding levels of other banks and hence satisfying the exclusion condition. However, if changes in national bank risk affect bank ownership across all banks, then these two instruments do not reduce endogeneity bias. This possibility is not very compelling because bank ownership structure has been shown to be sticky over time and is not correlated across banks within a country (Laeven and Levine 2009). Like Harford et al. (2018), to increase our sample size, we do not restrict our sample surrounding the Russell 1000/2000 cut-off; and this has the beneficial effect that there will be sufficient variation in our variables of interest, as well as improvement in the external validity of our estimates.

As shown in Table 4, the second-stage regressions produce robust results. The coefficients on both instrumented variables, $st\_\widehat{shareholdings}$ and $lt\_\widehat{shareholdings}$, are statistically significant with the predicted signs for all risk measures, except for *systematic risk*. As is often the case in 2SLS-IV estimation, the economic magnitudes of the marginal effects are substantially larger than in our single-stage panel estimations.[17] For example, a one-standard deviation increase in *st_shareholdings* is associated with an 11.40% increase in total risk in Table 4, which is four times larger than the 2.53% increase coming from our OLS estimations in Table 3.

4.2.2 Active Share

In our second approach to reduce the endogeneity concern, as per Cremers and Petajisto (2009), we split LT shareholders into two groups: LT indexers and non-indexers based on the "active share" measure of a shareholder's portfolio following a three-step process.[18] First, as shown in equation (3), the active share of a shareholder *i* at quarter *t* is computed as the sum of the absolute difference between the weight of each stock in a shareholder's portfolio ($\omega_{portfolio_i}$) and the weight of that stock in the benchmark index (ω_{index_i}), across the universe of all assets in the stock market. Guided by Ye (2012), we use the *S&P500* as the benchmark index, since it is the most general and most widely cited equity market index with constituent data available (Griffin and Xu 2009).

$$activeshare_{i,t} = \frac{1}{2}\sum_{i=1}^{N}\left|\omega_{portfolio_i} - \omega_{index_i}\right| \tag{3}$$

For institutions that do not short stocks or borrow on margins, the active share will range between 0% for those who precisely replicate the benchmark index and 100% for those who do not hold any stocks in the benchmark index. Second, we sort LT shareholders into terciles each quarter based on their active share measure; those in the bottom tercile are then classified as LT indexers, and those not in the top tercile

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[17] One important reason for this apparent discrepancy is because the 2SLS-IV is estimating the local average treatment effect (LATE), whereas OLS is estimating the average treatment effect (ATE) over the entire population. In the presence of heterogeneous sub-populations such as our US bank sample, it is plausible that LATE > ATE.

[18] Shareholders who index generally have a long horizon, mainly because the benchmark index composition changes infrequently; hence, we refrain from using the same split for ST shareholders.

are classified as LT non-indexers. Third, we calculate shareholdings for LT indexers (*lt_indexers*) and LT non- indexers (*lt_non-indexers*).[19]

The ability to split LT shareholders into plausibly exogenous indexers and possibly endogenous non-indexers provides an opportunity to evaluate endogeneity from self-selection bias. While active shareholders can exist in both categories, indexers clearly do not choose their portfolio firms – they are mandated to invest in stocks based on their inclusion in benchmark indices such as the S&P500. Thus, indexers are precluded from investing in firms based on their riskiness. Therefore, while *lt_indexers* are exogenous to bank outcomes, these shareholders are still capable of influencing bank policies and thereby bank risk, thus, these results are robust to self-selection bias and provide a strong form of identification (Matvos and Ostrovsky 2010).[20]

Table 5 shows the main results from estimating equation (2) using *lt_indexers* and *lt_non-indexers* replacing *lt_shareholdings*. While the significant coefficient on *st_shareholdings* retain its positive sign for all seven risk models, the significant negative coefficients on both *lt_indexers* and *lt_non-indexers* in our seven risk models validate that higher LT indexers and non-indexers is negatively associated with all but systematic risk. These results provide further confidence in the main results presented in Table 3 – they indicate that LT indexers facilitate the positive association between long-term shareholdings and systematic risk.

4.2.3 Propensity score matching

As a further approach to combatting endogeneity concerns, we also execute an average treatment effect analysis using PSM to reduce the concern that banks with high *lt-shareholdings* could be systematically different from banks with high *st_shareholdings*. Table OA.3 of the Online Appendix reports the results of

[19] The Online Appendix Table OA.2, Panel C highlights the top 10 LT shareholders identified as indexers during 2013, as per our process and we find that this tactic successfully identifies the largest index fund managers that cover the S&P500 such as Blackrock, and Vanguard.

[20] For example, the California Public Employees' Retirement System (CalPERS) uses screens based on public data to choose which of the firms in its portfolio to target for shareholder activism (Smith 1996). Similarly, recent anecdotal evidence shows that the tracking error constraints that prevent Vanguard from selling their shares in protest against undesirable corporate policies means that they increasingly rely on voting to exert influence (Kerber 2013).

the PSM. The PSM univariate results in Panel A of Table OA.3 shows the standardized differences (following Imbens 2000) of our covariates and risk proxies between treatment and control groups for the original and Kernel matched samples. Treatment group status is assigned to banks for which *lt_shareholdings* is greater than *st_shareholdings*. After Kernel weighting, the standardized differences in means of all covariates are statistically insignificant (except for charter value), while the differences in means of all risk proxies are negative and statistically significant at 1% level or better for all (except systematic risk).

After isolating selection bias with balancing of observables, we note that risk-taking is higher for banks dominated by long-term shareholding as opposed to short-term shareholdings. Panel B of Table OA.3 shows PSM-weighted regression of equation (2) where investor horizon is *dominant_lt,* a dummy variable, which equals one for banks with *lt_shareholdings* bigger than *st_shareholdings* in year and zero otherwise. The significant negative coefficient on *dominant_lt* for all risk proxies except for systematic risk confirms our OLS estimates in Table 3. In sum, the estimated average treatment effect on treated from the PSM analysis reaffirms our two hypotheses – namely, that bank risk decreases with short-term shareholdings (supporting H1) and increases with long-term shareholdings (supporting H2).

4.2.4 Additional control variables

There might also be unobservable time-varying factors that are omitted from the model; for instance, if LT shareholders primarily comprise pension funds and bank trust departments, then the association between LT shareholdings (investor horizon) and risk could be driven by the so-called prudent man rules, effectively limiting their investment opportunity to less risky firms (Del Guercio 1996). Accordingly, we conduct further analysis that aims to rule out this omitted variable bias concern. To this end, in unreported analysis, our main results remain robust to adding three CEO characteristics (*power*, *age*, *tenure*), and three board features (*board size*, *indep_directors*, *female*) to the vector X of control variables.[21]

[21] For details, see the Online Appendix Table OA.8.

4.2.5 *Multiple alternative proxies of key variables*

It is widely acknowledged that measurement error can create endogeneity issues. To combat this concern, we adopt a popular strategy of implementing a range of meaningful alternative proxies – the logic being that each proxy comes with a different (unknown) level of measurement error. To this end, most notably as already explained, we apply 7 alternative risk measures. Further, apart from our two main measures of shareholding investor horizons (st_shareholdings vs. lt_shareholdings), in the next section we explore 5 other nuanced shareholding measures (long-term indexers, long-term non-indexers, transient shareholders, quasi-indexers and dedicated shareholders). As already documented above, and also in further analysis that follows, we achieve a remarkably high degree of consistency in our results supporting both H1 and H2, across these various analyses.

4.2.6 *Sub-sampling analysis*

Sub-sampling analysis can help alleviate concerns about endogeneity. An example of this is outlined above regarding active share. In subsequent, analysis reported in the next section, two further sub-sampling tests are performed: small vs large banks and GFC vs non GFC. Again, the consistent insights we discern across these various investigations play their part, in an extensive package of considerations to repel the endogeneity critique.

4.2.7 *Economic channels*

A final empirical strategy that we adopt from the "armory" of contemporary empirical research is an evaluation of economic channels through which the hypothesized relation might plausibly play out or manifest. Such analysis can serve to enhance our confidence in causality, especially in the event that a range of potential mechanisms show a broader consistent story around key related economic relationships – which can be thought of as a type of empirical "triangulation" strategy. In the following section, we apply two types of channel analysis: (a) business policy; and (b) managerial incentives and dividend policy.

5. Extended Analysis

5.1 Business policy channels

Following prior studies (Bekkum 2016; Beltratti and Stulz 2012; Bennett et al. 2015; DeYoung et al. 2013), we investigate six business policy channels through which investor horizon maps into bank risk-taking: *core deposit ratio, non-performing loans (NPL) ratio, private mortgage-backed securities (MBS) ratio, government-sponsored MBS ratio, derivatives activities for trading,* and *derivative activities for hedging*.

The percentage of a bank's assets financed by customer deposits (*core deposit ratio*) is generally associated with low risk because customer deposits are a cheap and stable source of funding for banks (Beltratti and Stulz 2012). The percentage of a bank's loans that are delinquent or no longer accruing (*NPL ratio*) is a typical measure of a bank's *ex post* credit risk. The mix of mortgage-backed securities (MBS) on a bank's balance sheet could indicate either high or low risk-taking: Assets invested in MBS issued and guaranteed by government-sponsored enterprises like Fannie Mae, Freddie Mac and Ginnie Mae will tend to be low-risk investments (*GSE ratio*), but non-guaranteed MBS issued by private financial institutions—can incur substantial amounts of credit risk and interest rate risk (*private MBS ratio*). Derivatives activities for hedging purposes (*derivatives hedging ratio*) are intended to counterbalance on-balance sheet risk exposures, while derivatives activities for purposes other than hedging (*derivatives trading ratio*) expose the bank to both market risk and counter-party risk.

Table 6 presents the results of regression equation (2) for the above six business policy variables as the dependent variables. We find that banks with high *st_shareholdings* make business policy decisions that conform to high bank risk levels, while banks with high *lt_shareholdings* adopt business policies that match low risk. Based on OLS estimates in Panel A, a one-standard deviation increase in *st_shareholdings* is associated with a 2.81% reduced use of low-risky *core deposit ratio*; a 8.40% higher *NPL ratio*; a 39.45% larger *private MBS ratio*; and a 17.98% larger *derivatives trading ratio*. By contrast, a one-standard deviation increase in *lt_shareholdings* is associated with a 2.77% larger *core deposit ratio*; a 10.00% drop in *NPL ratio*; and a 4.65% reduced exposure to high-risk *derivatives trading ratio*. Each of these OLS estimates remain statistically significant in the 2SLS-IV approaches shown in Panel B, and the directions of these results are fully consistent with our central findings.

However, two results in Table 6 deserve special attention and some explanation, as they conflict our priors. For the *derivatives hedging ratio*, the estimated coefficient on *st_shareholdings* (*lt_shareholdings*) is significantly positive (negative) for both OLS and 2SLS-IV. The unexpected signs could reflect that banks with high *st_shareholdings* (*lt_shareholdings*) take more (less) interest rate risk, foreign exchange risk, and market risk, and as such have greater (less) need to hedge against these risks. Also, the significant positive coefficient on *st_shareholdings* for the *GSE MBS ratio* contrasts our expectation. Our finding could suggest that banks with high *st_shareholdings* also invested heavily in low-risk government-sponsored MBS because they were also promising high returns particularly prior to the financial crisis.

5.2 Managerial incentives and dividend policy channels

Several recent studies demonstrate that risk-taking in the lead-up to the 2007–2009 financial crisis was high in banks featuring CEO incentives that were better aligned with shareholders in terms of greater CEO equity-based compensation (Cheng et al. 2015), and higher pay-risk sensitivities (DeYoung et al. 2013). Table 7 (columns 1-4) reports the results of regression equation (2) for four alternative proxies of managerial incentives: *equity_pay*, *incentive_pay*, *pay-performance sensitivity* (*delta*), and *pay-risk sensitivity* (*vega*), as dependent variables. Table 1 defines these variables. The findings in Table 7 provide that banks with high *st_shareholdings* have CEO pay packages that encourage more risk-taking, while banks with high *lt_shareholdings* organize managerial incentives compatible to low risk.

Based on OLS estimates in Panel A, a one-standard deviation increase in *st_shareholdings* is associated with a 1.44% greater use of *equity_pay*; a 2.14% higher *incentive_pay*; a 3.49% larger *delta*, and 2.43% higher *vega*. In contrast, a one-standard deviation increase in *lt_shareholdings* is associated with a 2.48% reduced *equity_pay*; a 2.20% lower *incentive_pay*; a 3.90% smaller *delta*; and a 3.87% diminished *vega*. The significant coefficients on both $st\_share\widehat{hold}ings$ and $lt\_share\widehat{hold}ings$ in Panel B of Table 7 are as per our predictions and confirm each of our OLS estimates in Panel A. Overall, our results are consistent with LT (ST) shareholders favoring an incentive structure for their CEOs, which is compatible with less (more) bank risk-taking.

As an auxiliary test, we also examine if *st_shareholdings* and *lt_shareholdings* affect bank dividend policy and, in turn, bank risk. Previous studies document that dividend policy is associated with managerial entrenchment (e.g., Hu and Kumar 2004). In banking, dividends can be associated with risk shifting (Acharya, Le and Shin 2017); managerial entrenchment (Onali et al. 2016); and CEO risk incentives (Srivastav, Armitage, and Hagendorff 2014). The significant positive coefficient on *lt_shareholdings* in column 5 of Table 7 suggests that banks with greater LT shareholdings pay more dividends. Overall, these results suggest that LT shareholders curb bank risk-taking by shaping managerial incentives and use dividends as a way to reduce managerial entrenchment.

5.3 Financial performance

All else held equal, one would expect that, on average, banks taking higher (lower) levels of risk with greater *st_shareholdings* (*lt_shareholdings*) would produce concurrently higher (lower) returns. To explore this prediction, in Table 8, we report the outcome of re-estimating equation (2) with six measures of bank financial returns as the dependent variable estimated annually: *stock returns;* return on assets *(roa);* return on equi*ty (roe)*; size-adjusted buy-and-hold returns (*sizeadj_bhar*); net interest margin (*interest_margin*); and risk-adjusted stock returns (*riskadj_returns*). Definitions of all six variables are provided in Table 1.

Perhaps surprisingly, we find no evidence that the *st_shareholdings* induced greater risk-taking revealed in our above tests, leads to higher financial performance. Rather, we find economically large negative relations between *st_shareholdings* and bank performance (*stock return, sizeadj_bhar, interest_margin* and *riskadj_returns*) and large positive relations between *lt_shareholdings* and bank performance. These findings, however, are similar to Elyasiani and Jia (2008) as they show that institutional shareholder stability positively relates to bank performance. Based on the OLS estimates in Panel A, one-standard deviation increases in *st_shareholdings* is associated with 20.3% lower annual *stock returns*;

47.8% lower size-adjusted *bhar,* 0.5% decreased *interest_margin*, and 7.7% smaller *riskadj_returns*. Further, a one-standard deviation increase in *lt_shareholdings* is associated with 30.8% higher annual *stock returns*; 5.7% higher *roa*; 6.4% higher *roe*; 20% higher size-adjusted *bhar*, 0.8% greater net *interest_margin*, and 30% bigger *riskadj_returns*. The signs and statistical significance of these results are robust in the 2SLS-IV estimates shown in Panel B.

In sum, evidence based on our sample of U.S. listed commercial banks, shows higher ST (LT) shareholdings are performance reducing (performance enhancing). Interpreted together with our two previous sets of results—i.e., that high ST (LT) shareholdings influence bank decision-making predominantly to take on more (less) risk and that high ST (LT) shareholdings are associated with relatively aggressive business policy practices at banks—the results in Table 8 imply that banks with greater LT shareholdings are better able to resist non-productive risk-taking than are banks with more ST shareholdings.

5.4 Mediating role of bank competition

Although it is possible that ST shareholders could encourage management to pursue new, non-traditional, risky transaction-based business opportunities with more competition, how LT shareholders respond to such high-risk business opportunities with deregulation is not obvious. We base our approach on Rice and Strahan (2010) to construct a state level *RSindex* as a proxy of bank competition. The *RSindex* takes on values of zero to four, with a larger number indicating more competition. We then interact our proxy for the investor horizon variable (i.e., *st_shareholdings* or *lt_shareholdings*) with the *RSindex*, as shown in regression equation (4):

$$risk_{i,t} = \alpha + \beta' investorhorizon_{i,t-1} + \gamma_1 RSindex_{i,t-1} + \gamma_2 RSindex_{i,t-1} \times investorhorizon_{i,t-1} + \zeta' X_{i,t-1} + \delta_t + \varepsilon_{i,t} \quad (4)$$

The results of estimating (4) with our sample are shown in Panel A of Table 9. We see a significant negative coefficient on *RSindex* for all seven risk measures and this suggests that competition reduces risk which is in line with existing studies (Goetz et al. 2016). Regarding the mediating effect of bank competition, for ST shareholdings, the significant and positive coefficient on the interaction term *RSindex×st_shareholdings,* across all risk measures demonstrates that (excepting systematic risk) ST shareholdings' positive association with bank riskiness is amplified with more competition. Regarding LT shareholdings, however, the significant positive coefficients on *RSindex×lt_shareholdings* for all seven risk measures evidence that LT shareholdings have played a role in engaging riskier business opportunities available after deregulation. Overall, we find that although higher competition reduces bank risk, as a counter-weight, competition seems to diminish the role of other monitoring mechanisms to manage risk – as we show that bank competition intensifies the positive effect of *st_shareholdings* (diminishes the negative effect *lt_shareholdings*) on bank risk.

5.5 Mediating role of shareholders' rights

Previous studies show that various governance mechanisms can interact to influence bank policies (Fu et al. 2020; Gaganis, Lozano-Vivas, and Papadimitri 2020). However, due to mixed theories and empirical evidence, we have no *a priori* expectation for the direction of the mediating role of pre-determined shareholders rights on the relation between *investor horizon* and *risk*. We use the Bebchuck, Cohen, and Ferrell (2009) entrenchment index (*Eindex*) as a proxy to quantify shareholder rights. The *Eindex* reflects shareholders' ability to agitate management, which takes a value of zero to six, with a higher number representing weaker shareholder rights and governance. The *Eindex* is then interacted with either of our investor horizon proxies (*st_shareholdings* or *lt_shareholdings*) in our model, as shown in regression equation (5):

$$risk_{i,t} = \alpha + \beta' investorhorizon_{i,t-1} + \gamma_1 Eindex_{i,t-1} + \gamma_2 Eindex_{i,t-1} \times investorhorizon_{i,t-1} + \zeta' X_{i,t-1} + \delta_t + \varepsilon_{i,t} \quad (5)$$

The results of estimating (5) with our sample are shown in Panel B of Table 9. We see a significant negative coefficient on *Eindex* for five of our seven risk measures and this nicely complements prior studies (e.g., Beltratti and Stulz 2012; Erkens et al. 2012; Fahlenbrach and Stulz 2011; Leung et al. 2019), by showing that banks with weaker governance take less risk. As for the mediating role of shareholder' rights, the significant positive coefficient on the interaction term *Eindex×st_shareholdings,* in the last four columns indicates an incrementally larger positive effect of ST shareholdings on risk in banks with weaker governance (more restrictive shareholder rights). For LT shareholdings, however, the significant positive coefficients on *Eindex×lt_shareholdings* in all columns shows an incremental dampening effect of the base negative association between LT shareholdings and bank risk, in cases with more restrictive shareholders rights. Overall, weaker shareholder rights magnifies ST (dampens LT) shareholders' influence on management when pursuing high risk (low risk) corporate strategies. The essential value of this finding lies in how it extends the work of Fahlenbrach and Stulz (2011), Beltratti and Stulz (2012), and Erkens et al. (2012) by illustrating that the way governance structures affect bank risk is sensitive to investor horizon.

5.6 Bushee (1998) measures of investor horizon

To verify that the main findings in Section 4 are not sensitive to our measure of *investor horizon*, we use the two alternative measures (Bushee classification, active share measure) of *investor horizon.* We adopt Bushee's (1998) transient investor category (*tran_shareholdings*) as a new measure of ST shareholdings, and the sum of shareholdings by quasi-indexers and dedicated investors (*qix_ded_shareholdings*) as a new measure of LT shareholdings. Panel A of Online Appendix Table OA.4 presents the OLS estimates of equation (2) using the alternative Bushee measures as just described. Generally, this alternative analysis produces evidence of robust results. The estimated coefficients on *tran_shareholdings* are significantly positive in five of the seven models, while the estimated coefficients on *qix_ded_shareholdings* are significantly negative for six of the seven models – again, *systematic risk* is the odd one out.

5.7 Testing for non-linear associations[22]

We re-estimate our equation (2) separately for *st_shareholdings* and *lt_shareholdings,* with additional quadratic terms. The results are tabulated in Panels B and C of Online Appendix Table OA.4. In Panel B, we find some evidence that the relationship between *st_shareholdings* and bank risk is convex (i.e. U-shaped) for total and idiosyncratic risks. At lower levels of short-term shareholdings, bank risk tends to initially decline. Based on our estimates (illustrated in the case of total risk), the turning point occurs at a value of 0.117 (approximately at the 80th percentile of our sample) for short-term shareholdings. And so, beyond this sample value as short-term shareholdings increase the risk shifting effect from moral hazard tends to dominate and bank risk increases correspondingly.

As reported in Panel C, we find a concave relation (i.e. an inverted-U shape) relationship between bank risk and *lt_shareholdings* for four of risk proxies: systematic, tail, distance-to-default, and actuarial spreads. Thus, we find evidence that banks with low *lt_shareholdings* are associated with high risk. Based on our estimates (illustrated in the case of distance to default), the turning point occurs at a value of 0.1 (approximately at the 55th percentile of our sample) for long-term shareholdings. And so, beyond this sample value of high *lt_shareholdings* the risk averseness effect dominates, and banks seek conservative projects. In sum, the results for non-linearity testing suggests that either the risk-inducing effect of short-term shareholding or risk-reducing effect of long-term shareholdings is observed at higher levels of their respective shareholding.

[22] In unreported analysis, we explore another angle on the non-linearity effect. Specifically, we construct additional variables – top3_block_holdings; dummy variables indicating top 1 or top 2 or top 3 blockholder/s as LT shareholders, and dummy variables for top 1 or top 2 or top 3 blockholder/s as ST shareholders. We re-estimate our main model iteratively for various combinations of top3_block_holdings; st_shareholdings or lt_shareholdings and a dummy indicating whether the top block_holder is a LT or ST shareholder. This alternative analysis provides some evidence that either top3_block_holdings or st_shareholdings are involved with more risk-taking in the presence of top 1 ST shareholder, but we do not find evidence that the presence of top LT shareholders mitigates the risk-increasing effect of ST shareholdings. However, these results are not robust to alternative specifications/combinations and risk measures. We thank an anonymous referee for suggesting this line of enquiry. Details are available from the authors upon request.

5.8 Subsample analysis

Prior studies and anecdotal observation indicate that bank risk-taking differs in systematic ways with bank size, with charter value and with the intensity of regulatory attention. For example, DeYoung et al. (2019) show that large banks carry higher risks than smaller banks. In addition, large banks are more capable to absorb risk than small banks. It is commonly perceived that banks with high charter value — that is, banks that have relatively large shareholder value to lose — are less likely to take risks (Keeley 1990). In the context of our study, one might contend that an increase in charter value would strengthen the association between investor horizon and bank risk-taking. We investigate these perspectives in Online Appendix Table OA.5, where we re-estimate our main equation (2) for three sets of subsamples, and the dependent variable is *total risk* in all cases.

In Panel A, we split the data into small and large banks based on annual median bank size. In line with expectations, the estimated coefficients on *st_shareholdings* and *lt_shareholdings* retain statistical significance for large banks in both OLS and 2SLS-IV approaches. Further, there is strong evidence that our main finding is weaker for small banks. We conclude that bank size has an economically meaningful influence on the *investor horizon-total risk* relationship because the coefficient magnitudes are significantly different in both OLS and 2SLS-IV models. In Panel B of Online Appendix Table OA.5, we split the sample into low and high charter value banks based on the annual median value of Keeley's Q (the market value of equity plus the book value of liabilities divided by the book value of total assets). Consistent with our conjecture, we find that the *investor horizon-total risk* relationship is statistically stronger for banks with higher charter values.

In Panel C of Online Appendix Table OA.5, we split the sample into pre-crisis years (1993-2006) and post-crisis years (2010-2013). Six of the eight estimated coefficients on *investor horizon* are statistically significant, which is consistent with our main findings that bank risk is positively associated with ST shareholdings and negatively associated with LT shareholdings. Hence, we do not find any evidence that our main finding is weaker in the post-crisis period due to increased attention paid to banks in the form of increased pressure from media, Congress, and oversight from bank regulatory authorities.

5.9 Explaining 2007–2009 crisis period risk and performance

Several bank studies examining the underlying causes of the 2007–2009 financial crisis show that governance structures in 2006 were notable predictors of the crisis period returns and risk (e.g., Bekkum 2016; Bennett et al. 2015; Beltratti and Stulz 2012; Fahlenbrach, Prilmeier, and Stulz 2012; Fahlenbrach and Stulz 2011). In this regard, Online Appendix Table OA.6 reports the results of the cross-sectional regression equation (6), testing whether banks with larger LT (ST) shareholdings in 2006 experience better (worse) performance and low (high) risk during the 2007 and 2009 crisis period:

$$y_{i,2007-2009} = \alpha + \beta' investorhorizon_{i,2006} + \mu_1 y_{i,1998} + \mu_2 y_{i,2006} + \zeta' X_{i,2006} + \varepsilon_{i,2007-2009} \quad (6)$$

The dependent variable in equation (6) is bank risk in Panel A analysis, and bank financial performance in Panel B analysis, with each proxy measured as an average value between 2007–2009. As in the previous literature, we also include return and risk variables during 1998 and 2006 (Fahlenbrach et al. 2012; Beltratti and Stulz 2012; Erkens et al. 2012) as a proxy of "risk culture". The set of control variables (as denoted by **X**) remains the same as in equation (2) and is defined in Table 1, but is measured using 2006 observations.

Panel A of Online Appendix Table OA.6 shows that the evident effect of *st_shareholdings* (*lt_shareholdings*) on crisis period risk is almost triple (double) that seen during non-crisis times. In Panel B, as predicted, the significant coefficients on *st_shareholdings* and *lt_shareholdings* show that those banks with greater ST (LT) shareholdings prior to the crisis, performed significantly worse (better) once the crisis unfolded. These findings corroborate with those of Cella et al. (2013), which demonstrate that ST (LT) shareholders intensify (soften) the blow of negative systematic shocks to the stock prices of firms that they own. In sum, our results show that banks with greater LT (ST) shareholdings fared well (badly) during the crisis in terms of their better (worse) performance and reduced (increased) risk.

We also re-estimate our main equation (2) for the whole sample including observations from the crisis period, i.e., including 2007-2009, where our model incorporates a crisis period dummy (*gfc*) for 2007-2009 and two interaction terms: *st_shareholdings*×*gfc*, *lt_shareholdings*×*gfc*. In unreported analysis, we find a significant positive (negative) coefficient on *st_shareholdings*×*gfc* (*lt_shareholdings*×*gfc*), which affirms our results in Online Appendix Table OA.7 that banks with greater ST (LT) shareholdings observe more (less) risk during the crisis period.[23]

6. Conclusions

In response to the financial crisis 2007-2009, regulatory reforms around the word emphasized empowering shareholders to better monitor managers, aimed at reducing excess risk-taking by banks. Contrasting these initiatives, several studies show that banks in which managers' interests are better aligned with shareholders' interests, take more risk and perform worse particularly during periods of market stress. Theoretically this is not surprising: due to convex pay-offs from limited liability, combined with high leverage, deposit insurance, and government support, bank shareholders have unique incentives for high risk-taking to reap larger benefits "on-the-go" but this behavior potentially threatens long-term financial stability.

However, we argue that this high risk-taking incentive could be different between short-term (ST) shareholders versus long-term (LT) shareholders. For example, short-termism and managerial myopic behavior with ST shareholders could naturally match them to high risk-taking, while better monitoring

[23] This new set of analysis is reported in Panel B of Table OA.7 in the Online Appendix. In addition, Panel C of Table OA.7 shows that the sign of the coefficients on *st_shareholdings* and *lt_shareholdings* remains the same for our analysis using just the sub-sample of crisis period observations. Further, we also estimate our main equation (2) only for crisis period sample, i.e., observations from 2007-2009 period and tabulate these results in Panel C of Table OA.7. The interpretations of these new estimates for the crisis period sample are qualitatively similar to those for our "main sample" excluding the crisis period in Table 4, "whole sample" including crisis period in Panel A of Table OA.7, and "whole sample" including crisis period dummy and interaction terms in Panel B of Table OA.7. The Online Appendix Table OA.10 summarizes our main findings from our various analysis.

abilities of LT shareholders and their preference for long-term firm value could naturally match them to low bank risk. We test these conjectures for a sample of U.S. commercial banks between 1991 and 2013. As predicted, we find a well-identified, meaningful positive (negative) association between ST (LT) shareholding and bank risk. Thus, our core message is “one size does not fit all” – in the sense that not all shareholders of banks appear to suffer from moral hazard with the same intensity or experience high risk-taking incentives.

We showcase three nuanced outcomes within these findings. First, the risk-reduction that we observe at banks with high LT shareholdings is not achieved at the cost of lower financial returns; indeed, we find better stock returns at banks with higher LT shareholdings. Thus, comparatively lower risk-taking incentives with LT shareholdings is beneficial to shareholder value via improvements in both dimensions of the risk-return tradeoff. Second, we examine two direct channels of risk-taking: business policies and managerial incentives. For example, we show that banks with high LT shareholdings follow conservative business policies (e.g., less investment in risky private mortgage-back securities) and design executive compensation compatible to less risk-taking (e.g., providing less equity and option pay to CEOs). Third, we find that bank competition tends to amplify the moral hazard problem among bank shareholders, as it intensifies the positive association between ST shareholdings and bank risk and lessens the negative association between LT shareholdings and bank risk.

Our findings carry several important implications for banking regulation, particularly those efforts aimed at enhancing shareholder power vis-à-vis CEO power. Most importantly, the benefits of empowering bank shareholders is conditional on bank ownership types, since shareholder empowerment can misfire and result in increased risk-taking in banks dominated by short-term shareholders. While such an “empowerment” regulatory measure might satisfy majority demands for more “shareholder-friendly” governance, based on our evidence they could entertain moral hazard bias and, in turn, have unintended consequences – namely, to increase, rather than decrease, risk-taking in banks. Our analysis bearing on the question of competition also suggests that increased bank deregulation could have unintentional consequences by providing bank shareholders, opportunities to satisfy their desires which may not be compatible with prudential risk-taking.

Finally, our evidence suggests that Cheng et al.'s (2015) observation that greater institutional shareholding in the lead-up to the financial crisis increased the probability of banks taking excess risk is likely driven by ST rather than LT shareholdings. And, this knowledge is readily actionable. LT shareholder rights could be enhanced by introducing a duration-dependent sliding scale of voting rights. Conceivably, having LT-orientated bank boards that are insulated from market swings, combined with lengthening the vesting periods of management stock options, could be an effective tool for weakening undue ST shareholder influence.

References

Acharya, V., Le, H. T., and Shin, H. S. 2017. Bank capital and dividend externalities. *Review of Financial Studies*, 30(3): 988–1018.

An, H., and Zhang, T. 2013. Stock price synchronicity, crash risk, and institutional investors. *Journal of Corporate Finance*, 21(1): 1–15.

Anderson, R. C., and Fraser, D. R. 2000. Corporate control, bank risk taking, and the health of the banking industry. *Journal of Banking and Finance*, 24(8): 1383–1398.

Appel, I., Gormley, T., and Keim, D. B. 2016. Passive investors, not passive owners. *Journal of Financial Economics*, 121(1): 111–141.

Bair, S. 2011. *Address to the National Press Club, online transcript, viewed 29 August 2017, https://www.fdic.gov/news/news/speeches/chairman/spjun2411.html*

Bali, T. G., Cakici, N., Yan, X., and Zhang, Z. H. E. 2005. Does idiosyncratic risk really matter? *Journal of Finance*, 60(2): 905–929.

Bebchuck, L., Cohen, A., and Ferrell, A. 2009. What matters in corporate governance? *Review of Financial Studies,* 22(2): 783–827.

Bekkum, S. 2016. Inside debt and bank risk. *Journal of Financial and Quantitative Analysis*, 51(2): 359–385.

Beltratti, A., and Stulz, R. 2012. The credit crisis around the globe: Why did some banks perform better? *Journal of Financial Economics*, 105(1): 1–17.

Bennett, R. L., Güntay, L., and Unal, H. 2015. Inside debt, bank default risk, and performance during crisis. *Journal of Financial Intermediation*, 24(4): 487–513.

Berger, A., and Bouwman, C. 2013. How does capital affect bank performance during financial crises? *Journal of Financial Economics*, 109(1): 146–176.

Black, F., and Scholes, M. 1973. The pricing of options and corporate liabilities. *Journal of Political Economy*, 81(3): 637–654.

Bogle, J. 2009. The Fiduciary principle: No man can serve two masters. *Journal of Portfolio Management*, 36(1): 15–25.

Bolton, P., Scheinkman, J., and Xiong, W. 2006. Executive compensation and short-termist behaviour in speculative markets. *Review of Economic Studies*, 73(3): 577–610.

Boone, A. L. and White, J. T. 2015. The effect of institutional ownership on firm transparency and information production. *Journal of Financial Economics*, 117(3): 508–533.

Boyallian, P. and Ruiz-Verdú, P. 2018. Leverage, CEO risk-taking incentives, and bank failure during the 2007–10. *Review of Finance*, 22(5): 1763–1805.

Brandon, C., Fu, X., and Tang, T. 2020. Shareholder investment horizons and bank debt financing. *Journal of Banking and Finance*, forthcoming.

Brav, A., Jiang, W., Ma, S., and Tian, X. 2018. How does hedge fund activism reshape corporate innovation? *Journal of Financial Economics*, 130(2): 237–264.

Burns, N., Kedia, S., and Lipson, M. 2010. Institutional ownership and monitoring: Evidence from financial misreporting. *Journal of Corporate Finance*, 16(4): 443–455.

Bushee, B. 1998. The influence of institutional investors on myopic R&D investment behavior. *The Accounting Review,* 73(3): 305–333.

Bushman, R. M., Hendricks, B. E., and Williams, C. D. 2016. Bank competition: Measurement, decision-making, and risk-taking. *Journal of Accounting Research*, 55(3): 777–826.

Callen J.L. and Fang, X. 2013. Institutional investor stability and crash risk: Monitoring versus short-termism? *Journal of Banking and Finance*, 37(8), 3047–3063.

Caprio, G., Laeven, L., and Levine, R. 2007. Governance and bank valuation. *Journal of Financial Intermediation*, 16(4): 584–617.

Cella, C., Ellul, A., and Giannetti, M. 2013. Investors' horizons and the amplification of market shocks. *Review of Financial Studies*, 26(7): 1607–1648.

Cheng, H., Huang, D., and Luo, Y. 2020. Corporate disclosure quality and institutional investors' holdings during market downturns. *Journal of Corporate Finance*, forthcoming.

Cheng, I., Hong, H., and Scheinkman, J. 2015. Yesterday's heroes: Compensation and risk at financial firms. *Journal of Finance*, 70(2): 839–879.

Coles, J. L., Daniel, N. D., and Naveen, L. 2006. Managerial incentives and risk-taking. *Journal of Financial Economics*, 79(2): 431–468.

Cremers, M., and Petajisto, A. 2009. How active is your fund manager? A new measure that predicts performance. *Review of Financial Studies*, 22(9): 3329–3365.

Cremers, M., Pareek, A., and Sautner, Z. 2020. Short-term investors, long-term investments, and firm value. *Management Science*, 66(10): 4535–4551.

Dallas, L. 2011. Short-termism, the financial crisis, and corporate governance. *Journal of Corporation Law*, 37(2): 264–280.

Del Guercio, D. 1996. The distorting effect of the prudent-man laws on institutional equity investments. *Journal of Financial Economics*, 40(1): 31–63.

Derrien, F., Kecskés, A., and Thesmar, D. 2013. Investor horizons and corporate policies. *Journal of Financial and Quantitative Economics,* 48(6): 1755–1780.

Dewatripont, M., and Tirole, J. 1994. The prudential regulation of banks. MIT Press.

DeYoung, R., Haq, M., Morgan, J., and Pathan, S. 2020. CEO pay gap and bank risk-taking. *Working Paper, University of Kansas*.

DeYoung, R., Peng, E., and Yan, M. 2013. Executive compensation and business policy choices at US commercial banks. *Journal of Financial and Quantitative Economics*, 48(1): 165–196.

Duan, J. C. 2014. Actuarial par spread and empirical pricing of CDS by decomposition. *Global Credit Review*, 4: 51–65.

Duan, J.C., and Wang, T. 2012. Measuring distance-to-default for financial and non-financial firms. *Global Credit Review*, 2: 2012, 95–108.

Ellul, A., and Yerramilli, V. 2013. Stronger risk controls, lower risk: Evidence from US bank holding companies. *Journal of Finance*, 68(5): 1757–1803.

Elyasiani, E., and Jia, J.J. 2008. Institutional ownership stability and BHC performance. *Journal of Banking and Finance*, 32(9): 1767–1781.

Elyasiani, E, Jia, J.J. and Mao, C. X. 2010. Institutional ownership stability and the cost of debt. *Journal of Financial Markets*, 13(4): 475–500.

Erkens, D., Hung, M., and Matos, P. 2012. Corporate governance in the 2007–2008 financial crisis: Evidence from financial institutions worldwide. *Journal of Corporate Finance*, 18(2): 389–411.

Fahlenbrach, R., Prilmeier, R., and Stulz, R. 2012. This time is the same: Using bank performance in 1998 to explain bank performance during the recent financial crisis. *Journal of Finance*, 67(6): 2139–2185.

Fahlenbrach, R., and Stulz, R. 2011. Bank CEO incentives and the credit crisis. *Journal of Financial Economics*, 99(1): 11–26.

Flannery, M. 1998. Using market information in prudential bank supervision: A review of the U.S. empirical evidence. *Journal of Money, Credit and Banking*, 30(3): 273–305.

Fu, X., Kong, L., Tang, T., and Yan, X. 2020. Insider trading and shareholder investment horizons. *Journal of Corporate Finance,* forthcoming.

Gaganis, C., Lozano-Vivas, A., and Papadimitri, P. 2020. Macroprudential policies, corporate governance and bank risk: Cross-country evidence. *Journal of Economic Behavior and Organization*, 169(1): 126–142.

Galai, D., and Masulis, R. 1976. The option pricing model and the risk factor of stock. *Journal of Financial Economics*, 3 (1–2): 53–81.

Garel, A., and Petit-Romec, A. 2017. Bank capital in the crisis: It's not just how much you have but who provides it. *Journal of Banking and Finance*, 75(2): 152–166.

Gaspar, J., Massa, M., and Matos, P. 2005. Shareholder investment horizons and the market for corporate control. *Journal of Financial Economics*, 76(1): 135–165.

Goetz, M., Laeven, L., and Levine, R. 2016. Does the geographic expansion of banks reduce risk? *Journal of Financial Economics*, 120(2): 346–362.

Gorton, G., and Rosen, R. 1995. Corporate control, portfolio choice, and the decline of banking. *Journal of Finance*, 50(5): 1377–1420.

Goyal, A., and Santa-Clara, P. 2003. Idiosyncratic risk matters! *Journal of Finance*, 58(3): 975–1008.

Graham, J. R., Harvey, C. R., and Rajgopal, S. 2005. The economic implications of corporate financial reporting. *Journal of Accounting and Economics*, 40(1–3): 3–73.

Griffin, J., and Xu, J. 2009. How smart are the smart guys? A unique view from hedge fund stock holdings. *Review of Financial Studies*, 22(7): 2531–2570.

Harford, J., Kecskés, A., and Mansi, S. 2018. Do long-term investors improve corporate decision making? *Journal of Corporate Finance*, 2(3): 424–452.

Hu, A., and Kumar, P. 2004. Managerial entrenchment and payout policy. *Journal of Financial and Quantitative Analysis*, 39(4): 759–790.

Huang, K., and Petkevich, A. 2016. Corporate bond pricing and ownership heterogeneity. *Journal of Corporate Finance*, 36(1): 54–74.

Imbens, G. W. 2000. The role of the propensity score in estimating dose-response functions. *Biometrica*, 87(3): 706–710.

Jensen, M., and Meckling, W. 1976. Theory of the firm: managerial behavior, agency costs and shareholders structure. *Journal of Financial Economics*, 3(4): 305–360.

Kahn, C., and Winton, A. 1998. Ownership structure, speculation, and shareholder intervention. *Journal of Finance*, 53(1): 99–129.

Keeley, M. 1990. Deposit insurance, risk, and market power in banking. *American Economic Review*, 80(5): 1183–1200.

Kerber, R. 2013. Passive fund manager Vanguard turns activist in some board votes. *Reuters* 13 September. Viewed on 22 March 2016, <reuters.com>

Laeven, L., and Levine, R. 2009. Bank governance, regulation and risk taking. *Journal of Financial Economics*, 93(2): 259–75.

Leung, W. S., Song, W., and Chen, J. 2019. Does bank stakeholder orientation enhance financial stability? *Journal of Corporate Finance*, 56(1): 38–63.

Livne, G., Markarian, G., and Mironov, M. 2013. Investment horizon, risk, and compensation in the banking industry. *Journal of Banking and Finance*, 37(9): 3669–3680.

Matvos, G., and Ostrovsky, M. 2010. Heterogeneity and peer effects in mutual fund proxy voting. *Journal of Financial Economics*, 98(1): 90–112.

Maug, E. 1998. Large shareholders as monitors: Is there a trade-off between liquidity and control? *Journal of Finance*, 53(1): 65–98.

McCahery, J., Sautner, Z., and Starks, L. 2016. Behind the scenes: The corporate governance preferences of institutional investors. *Journal of Finance*, 71(6): 2905–2932.

Merton, R. 1977. An analytic derivation of the cost of the deposit insurance and loan guarantees: An application of modern option pricing theory. *Journal of Banking and Finance*, 1(1): 3–11.

Morgan, D. 2002. Rating banks: risk and uncertainty in an opaque industry. *American Economic Review*, 92(4): 874–888.

Nofsinger, J. R., Sulaeman, J., and Varma, A. 2019. Institutional investors and corporate social responsibility. *Journal of Corporate Finance*, 58(3): 700–725.

Nguyen, P-A, Kecskés, A, and Mansi, S. 2020. Does corporate social responsibility create shareholder value? The importance of long-term investors. *Journal of Banking and Finance*, forthcoming.

Onali, E., Galiakhmetova, R., Molyneux, P., and Torluccio, G. 2016. CEO power, government monitoring, and bank dividends, *Journal of Financial Intermediation*, 27(1): 89–117.

Polk, C., and Sapienza, P. 2009. The stock market and corporate investment: A test of catering theory. *Review of Financial Studies*, 22(1): 181–217.

Porter, M. 1992. Capital disadvantage: America's falling capital investment system. *Harvard Business Review*, 65–83.

Pukthuanthong, K., Turtle, H., Walker, T., and Wang, J. 2017. Litigation risk and institutional monitoring. *Journal of Corporate Finance*, 45(3): 342–359.

Rice, T., and Strahan, P. 2010. Does credit competition affect small-firm finance? *The Journal of Finance*, 65(3): 861–889.

Smith, M. 1996. Shareholder activism by institutional investors: Evidence from CalPERS. *Journal of Finance*, 51(1): 227–252.

Srivastav, A., Armitage, S., and Hagendorff, J. 2014. CEO inside debt holdings and risk-shifting: Evidence from bank payout policies. *Journal of Banking and Finance*, 47(3): 41–53.

Stein, J. 1989. Efficient capital markets, inefficient firms: A model of myopic corporate behavior. *Quarterly Journal of Economics*, 104(4): 655–669.

Switzer, L.N., and Wang, J. 2017. Institutional investment horizon, the information environment, and firm credit risk. *Journal of Financial Stability*, 29(1): 57–71.

Yan, X. and Zhang, Z. 2009. Institutional investors and equity returns: Are short-term institutions better informed? *Review of Financial Studies*, 22 (2): 893–924.

Ye, P. 2012. The value of active investing: Can active institutional investors remove excess comovement of stock returns? *Journal of Financial and Quantitative Analysis*, 47(3): 667–688.

Table 1: Variable definitions

Label	Description
Investor horizon proxies	[Sources: Thomson Reuters Institutional Holdings (13F) Database (formerly CDA/Spectrum)]
st_shareholdings	Four-quarter average of the proportion of total shares outstanding held by ST institutional shareholders, where shareholders are classified as ST according to Yan and Zhang's (2009) procedure (See equation 1).
lt_shareholdings	Four-quarter average of the proportion of total shares outstanding held by LT institutional shareholders, where shareholders are classified as long term according to Yan and Zhang's (2009) procedure (See equation 1).
lt_indexers	Four-quarter average of the proportion of total shares outstanding held by LT indexing investors, where LT indexing shareholders are identified using the Cremers and Petajisto (2009) active share measure (See equation 3).
lt_non-indexers	Four-quarter average of the proportion of total shares outstanding held by LT non-indexing investors, where LT non-indexing investors are identified using the Cremers and Petajisto (2009) active share measure (See equation 3).
tran_shareholdings	Four-quarter average of the proportion of total shares outstanding held by transient institutional shareholders as classified by Bushee (1998). Transient shareholders have short-term horizon, high portfolio turnover, and greater diversification.
quasi-indexers_shareholdings	Four-quarter average of the proportion of total shares outstanding held by quasi-indexer institutional shareholders as classified by Bushee (1998). Quasi-indexers have long-horizon, low portfolio turnover, and greater diversification.
dedicated_shareholdings	Four-quarter average of the proportion of total shares outstanding held by dedicated institutions, as classified by Bushee (1998). Dedicated shareholders have long-term horizon, low portfolio turnover, and less diversification.
Instrumental variables	[Source: Thomson Reuters Institutional Holdings (13F) Database (formerly CDA/Spectrum)] unless mentioned otherwise.
russell2000	A dummy variable that equals one if a bank is in the Russell 2000 index at the end of June in each year. [FTSE-Russell Investments]
industry_st	The average of *st_shareholdings* of all bank in year *t* excluding the *st_shareholdings* of bank *i*.
industry_lt	The average of *lt_shareholdings* of all bank in year *t* excluding the *lt_shareholdings* of bank *i*.
Risk measures	[Sources: CRSP, Bank Regulatory Database (FRB Chicago), and Credit Research Initiative (CRI) by Risk Management Institute (RMI) of National University of Singapore (NUS)]
total risk	The standard deviation of the bank's daily stock returns measured over a year.
idiosyncratic risk	The standard deviation of the residuals from a single-index market model, estimated each year for each bank.
systematic risk	The coefficient on the CRSP value-weighted market index return from a single-index market model, estimated each year for each bank.
tail risk	The marginal expected shortfall measured as the negative of the bank's average return over the 5% worst return days for the CRSP value-weighted market index return.
inverse Z-Score	The natural log of 1/Z-Score, where Z-score = {Average(ROA) + Average(Equity/Total assets)}/SD(ROA). This variable is calculated over a rolling five-year window.
distance-to-default	A rolling five-year average of the probability that a bank will default on its debt, where the probability is obtained from the price of a call option on the bank's equity with a strike price equal to the value of the bank's debt obligations. [Risk Management Institute of the National University of Singapore]
actuarial spread	A rolling five-year average of a bank's credit risk based on the price (spread) of credit default swaps on its own debt obligations. [Risk Management Institute of the National University of Singapore]
Business policy variables	[Sources: Bank Regulatory Database (FRB of Chicago)]
core deposit ratio	Deposits of the bank (excluding time deposits of over $100,000 and excluding all brokered deposits) scaled by total assets.
NPL ratio	The sum of loans past 90 days due and loans with nonaccrual status as a percentage of total loans
private MBS ratio	Total value of private-label mortgage backed securities as a percentage of total assets.
GSE MBS ratio	Total value of government sponsored mortgage backed securities (GSEs) as a percentage of total assets.
derivative trading ratio	Gross notional amount of derivative contracts held for trading scaled by total assets.
derivative hedge ratio	Gross notional amount of derivative contracts for hedging purposes scaled by total assets.
dividend payout ratio	The amount of dividend scaled by total earnings.

Mgr incentives & dividend	[Source: DEF 14A proxy statements]
equity_pay	The value of stocks held by a CEO (following Coles et al. 2006).
incentive_pay	The sum of the value of stocks and options held by a CEO (following Coles et al. 2006).
delta	A change in a CEO's total pay for a percentage change in the stock price (following Coles et al. 2006)
vega	A change in a CEO's total pay for a percentage change in the annualized standard deviation of stock returns (following Coles et al. 2006).
% dividend	Dividend per share as a percentage of earnings per share.
Performance variables	[Sources: CRSP, and Bank Regulatory Database (FRB Chicago)]
stock returns	The average of daily bank stock return in a year.
roa	The ratio of net income to total assets.
roe	The ratio of net income to total equity.
sizeadj_bhar	The buy-and-hold return (bhar) adjusted for bank size. Particularly, $sizeadj\_bhar_{i,t} = bhar_{it} - \overline{bhar_{size_t}}$, where $\overline{bhar_{size_t}}$ is the mean of $bhar_{it}$ of banks within the same bank size quartile, where banks are grouped into five quartiles based on their total assets.
interest_margin	The ratio of net interest income to total assets.
riskadj_returns	The ratio of *stock returns* to *total risk*.
Controls	[Sources: Bank Regulatory Database (FRB of Chicago) and ISS (formerly RiskMetrics)]
institutional shareholdings	Four-quarter average of the proportion of total shares outstanding held by all institutional shareholders.
ln(assets)	The natural logarithm of book value of total assets.
loan loss provision	The ratio of the loan loss provisions to total loans.
charter value (CV)	Keeley's (1990) Q calculated as the market value of equity plus the book value of liabilities divided by the book value of total assets.
non-interest income	Total non-interest income divided by the sum of interest income and non-interest income.
revenue growth	The growth in total revenue from the beginning of year *t-1* to the beginning of year *t.*
equity ratio	The ratio of the book value of equity to total assets.
RSindex	Rice and Strahan's (2010, 868) competition index based on interstate banking deregulation. It ranges from zero (highly regulated) to four (deregulated) based on four provisions: the minimum age of three for the out-of-state acquirers; allow de novo interstate branching; allow acquisition of individual branches by out-of-state institutions; and a statewide deposit cap of 30% on branch acquisition.
Eindex	Bebchuck et al. (2009) entrenchment index as a proxy of shareholder rights. It ranges from zero (high shareholder rights) to six (weak shareholder rights) based on the existence of six anti-takeover provisions: staggered boards, limits to shareholder by-law amendments, supermajority requirements for mergers, super-majority requirements for charter amendments, poison pills and golden parachutes. .
CEO and board traits	[Source: DEF 14A proxy statements]
power	The sum of two binary variables: CEO duality, and internally-hired CEO. CEO duality equals one when CEO chairs the board, otherwise zero. Internal-hired CEO equals one if CEO is internally hired, otherwise zero. A CEO is 'internally-hired' when the CEO is either founder or was an executive before being promoted to the CEO position. Alternatively, when the CEO is not externally-hired, it is termed as 'internally-hired' CEO.
tenure	The number of years for which the CEO is holding the "CEO" title with the bank.
age	The age of the bank CEO in years.
board size	The total number of directors in a bank board
indep_director	The total number of independent directors as a percentage of board size.
female	The number of female directors as a percentage of board size.

Table 2: Summary statistics

This table reports the summary statistics for the full sample of banks from 1991 to 2013. All variables are defined in Table 1.

	obs	mean	std dev	25th percent	median	75th percent
Main test variables						
st_shareholdings	5,791	0.07	0.07	0.02	0.04	0.10
lt_shareholdings	5,791	0.10	0.08	0.04	0.08	0.15
lt_indexers	5,791	0.04	0.04	0.01	0.02	0.05
lt_non-indexers	5,791	0.07	0.06	0.02	0.05	0.10
tran_shareholdings	5,791	0.06	0.07	0.01	0.03	0.08
quasi-indexers_shareholdings	5,791	0.19	0.15	0.08	0.15	0.27
dedicated_shareholdings	5,791	0.04	0.06	0.00	0.01	0.05
Instrumental variables						
russell2000	4,360	0.210	0.408	0	0	0
industry_st	4,360	0.060	0.014	0.049	0.061	0.070
industry_lt	4,360	0.087	0.032	0.067	0.076	0.092
Risk variables						
total	5,791	0.0221	0.0112	0.0152	0.0194	0.0254
idiosyncratic	5,791	0.0205	0.0113	0.0136	0.0177	0.0238
systematic	5,791	0.6465	0.5306	0.2045	0.5799	1.0296
tail	5,791	0.0118	0.0120	0.0035	0.0103	0.0177
ln(inverse Z-score)	5,141	-3.42	0.46	-3.63	-3.35	-3.15
ln(distance-to-default)	5,791	-4.44	0.97	-5.06	-4.47	-3.83
ln(actuarial spread)	5,791	3.99	0.68	3.54	3.94	4.42
Business policy variables						
core deposit ratio	5,791	0.61	0.14	0.55	0.64	0.71
NPL ratio	5,791	0.02	0.02	0.01	0.01	0.02
private MBS ratio (%)	1,485	1.32	3.04	0.00	0.05	1.25
GSE MBS ratio (%)	1,485	0.13	1.03	0.00	0.00	0.00
derivatives trading ratio (ratio)	2,004	1.92	2.98	0.22	1.84	3.75
derivatives hedge ratio (ratio)	2,004	0.92	1.76	-0.13	1.02	2.17
dividend payout ratio	5,791	36.52	43.62	25.95	36.31	45.24
Mgr incentive and dividend						
ln(equity_pay)	1,529	9.30	1.72	8.26	9.25	10.40
ln(incentive_pay)	1,536	9.67	1.61	8.61	9.62	10.72
ln(1+delta)	1,536	5.30	1.59	4.26	5.25	6.36
ln(1+vega)	1,429	3.77	1.81	2.75	3.74	4.96
% dividend	5,791	36.64	19.49	24.95	36.31	45.24
Performance variables						
stock return	5,791	0.24	0.38	-0.00	0.19	0.42
roa	5,791	0.008	0.006	0.006	0.010	0.012
roe	5,791	0.095	0.069	0.067	0.108	0.140
sizeadj_bhar	5,791	0.045	0.306	-0.127	0.011	0.191
interest_margin	5,791	0.03	0.01	0.03	0.03	0.04
riskadj_returns	5,791	11.98	14.64	-0.037	9.77	22.089
Controls						
institutional shareholdings	5,791	0.28	0.20	0.12	0.22	0.40
assets ($bn)	5,791	15.92	53.97	0.81	1.94	6.47
ln(assets)	5,791	14.69	1.63	13.49	14.37	15.59
loan loss provision	5,791	0.13	0.19	0.04	0.07	0.13
charter value	5,791	1.05	0.07	1.00	1.04	1.09
non-interest income	5,791	0.17	0.12	0.10	0.15	0.21
revenue growth	5,791	0.08	0.20	-0.04	0.05	0.17
equity ratio	5,791	0.09	0.03	0.07	0.09	0.10
RSindex	5,791	2.09	1.72	0	2	4
Eindex	1,322	2.39	1.37	1	2	3
CEO and board traits						
power	1,425	1.40	0.63	1.00	1.00	2.00
tenure	1,425	8.78	7.89	3.00	7.00	14.00
age	1,425	55.78	8.18	51.00	56.00	60.00
board size	1,425	13.42	4.72	10.00	12.00	16.00
indep_director	1,425	0.67	0.15	0.58	0.68	0.78
female	1,425	0.01	0.11	0	0	0

Table 3: *Investor horizon* and bank risk – baseline results

This table presents the results of equation (2) estimated using ordinary least squares techniques. The dependent variable is captured by seven alternative measures of bank risk. Each regression controls for seven covariates: *institutional shareholdings,* l*n(assets)*, *loan loss provision*, *charter value*, *non-interest income*, r*evenue growth,* and e*quity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	*total risk$_t$*	*idiosyncratic risk$_t$*	*systematic risk$_t$*	*tail risk$_t$*	*ln(inverse Z-score)$_t$*	*ln(distance-to-default)$_t$*	*ln(actuarial spread)$_t$*
st_shareholdings$_{t-1}$	0.008***	0.014***	0.996***	0.026***	1.50**	1.87**	0.210
	(0.002)	(0.002)	(0.119)	(0.003)	(0.70)	(0.94)	(0.151)
lt_shareholdings$_{t-1}$	-0.013***	-0.015***	0.741***	-0.005**	-1.485**	-0.787***	-0.521***
	(0.003)	(0.002)	(0.108)	(0.003)	(0.672)	(0.205)	(0.134)
inst. shareholdings $_{t-1}$	-0.002	-0.007**	0.053	0.001	0.098	-0.220	-0.183*
	(0.002)	(0.003)	(0.082)	(0.002)	(0.173)	(0.157)	(0.103)
ln(assets)$_{t-1}$	-0.000	-0.001**	0.104***	0.003***	0.027	0.221***	0.144***
	(0.000)	(0.000)	(0.017)	(0.000)	(0.034)	(0.032)	(0.021)
loan loss provision $_{t-1}$	0.022***	0.021***	0.208***	0.007***	-0.133	1.112***	0.839***
	(0.001)	(0.001)	(0.034)	(0.001)	(0.084)	(0.068)	(0.044)
charter value $_{t-1}$	0.005*	0.001	0.540***	0.021***	1.485***	-2.030***	-1.199***
	(0.003)	(0.003)	(0.127)	(0.003)	(0.267)	(0.242)	(0.158)
non-interest income$_{t-1}$	0.000	-0.001	-0.232**	-0.004*	0.113	0.221	0.144
	(0.002)	(0.002)	(0.093)	(0.002)	(0.197)	(0.174)	(0.114)
revenue growth $_{t-1}$	-0.003***	-0.004***	0.064**	0.001	-0.214***	0.652***	0.406***
	(0.001)	(0.001)	(0.027)	(0.001)	(0.066)	(0.053)	(0.034)
equity ratio $_{t-1}$	-0.062***	-0.072***	0.867***	0.026***	-7.351***	-6.635***	-4.641***
	(0.007)	(0.007)	(0.321)	(0.008)	(0.815)	(0.608)	(0.398)
constant	0.028***	0.041***	-1.745***	-0.060***	-4.696***	-3.886***	4.354***
	(0.006)	(0.005)	(0.266)	(0.006)	(0.634)	(0.506)	(0.331)
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (overall)	0.486	0.479	0.475	0.524	0.395	0.371	0.553
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833

Table 4: *Investor horizon* and bank risk – 2SLS-IV estimations

This table presents partial results of two-stage least squares instrumental variables estimation of equation (2). The first-stage dependent variable is *st_shareholdings* or *lt_shareholdings*. The second-stage dependent variable is captured by seven alternative measures of bank risk. Each regression controls for seven covariates: *institutional shareholding, ln(assets)*, *loan loss provision*, *charter value*, *non-interest income*, r*evenue growth,* and e*quity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	first-stage results		second-stage results						
			(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	*st_shareholdings$_t$*	*lt_shareholdings$_t$*	*total risk$_t$*	*idiosyncratic risk$_t$*	*systematic risk$_t$*	*tail risk$_t$*	*ln(inverse Z-score)$_t$*	*ln(distance-to-default)$_t$*	*ln(actuarial spread)$_t$*
$st\_\widehat{shareholdings}_{t-1}$			0.036***	0.049***	2.540**	0.407***	4.534***	11.298***	11.184***
			(0.015)	(0.014)	(1.148)	(0.066)	(1.509)	(2.031)	(1.531)
$lt\_\widehat{shareholdings}_{t-1}$			-0.040***	-0.037***	4.503***	-0.126***	-2.297**	-12.338***	-8.510***
			(0.006)	(0.006)	(0.469)	(0.030)	(0.955)	(0.848)	(0.639)
russell2000$_{t-1}$	0.018**	-0.028***							
	(0.007)	(0.007)							
industry_st	1.184***	-0.649***							
	(0.134)	(0.137)							
industry_lt	-0.103***	0.852***							
	(0.046)	(0.059)							
Covariates?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Under identification test:									
Kleiberger-Paap rk LM test	40.57***								
Weak identification test:									
Cragg-Donald F-test	31.36***								
Angrist-Pischke F-test	63.27***	285.38***							
Hansen J-stats			1.78	0.904	0.285	0.281	0.097	1.465	1.457
[p-value]			[0.913]	[0.432]	[0.374]	[0.391]	[0.756]	[0.912]	[0.430]
R^2 (overall)			0.412	0.429	0.327	0.513	0.214	0.371	0.295
Obs./# banks			5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833

Table 5: *Investor horizon* and bank risk – *Active share measure*

This table presents partial results of ordinary least squares estimations of equation (2) using long-term indexer and long-term non-indexer following active share measure Cremers and Petajisto (2009). The dependent variable is captured by seven alternative measure of bank risk. Each regression controls for seven covariates: *institutional shareholdings, ln(assets)*, *loan loss provision*, *charter value*, *non-interest income*, r*evenue growth,* and e*quity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	(1) *total risk$_t$*	(2) *idiosyncratic risk$_t$*	(3) *systematic risk$_t$*	(4) *tail risk$_t$*	(5) *ln(inverse Z-score)$_t$*	(6) *ln(distance-to-default)$_t$*	(7) *ln(actuarial spread)$_t$*
st_shareholdings$_{t-1}$	0.005***	0.007**	0.917***	0.026***	1.43**	1.40**	0.213
	(0.002)	(0.003)	(0.153)	(0.004)	(0.61)	(0.59)	(0.192)
lt_indexers$_{t-1}$	-0.009**	-0.012***	0.950***	-0.010**	-1.09***	-0.702**	-0.364*
	(0.004)	(0.004)	(0.175)	(0.004)	(0.39)	(0.33)	(0.218)
lt_non-indexers$_{t-1}$	-0.009***	-0.009***	0.467***	-0.001	-0.930**	-0.689**	-0.445**
	(0.003)	(0.003)	(0.160)	(0.004)	(0.37)	(0.30)	(0.197)
Covariates?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (adj)	0.497	0.481	0.480	0.527	0.411	0.393	0.547
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833

Table 6: Channels underlying horizon-risk nexus – business policies

This table presents partial results of equation (2) estimated using ordinary least squares techniques in Panel A, and two-stage least squares instrumental variables techniques in Panel B. The dependent variable is captured by six measures of business policies: *core deposit ratio*, *NPL ratio*, *private MBS ratio*, *GSE ratio*, *derivatives trading ratio*, and *derivatives hedging ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. Each regression has missing observations due to the matching of different business policy measures with *investor horizon*. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Table 1.

Dependent variable:	(1) *core deposit ratio*	(2) *NPL ratio*	(3) *private MBS ratio*	(4) *GSE MBS ratio*	(5) *derivatives trading ratio*	(6) *derivatives hedging ratio*
			Panel A: OLS estimates			
$st\_shareholdings_{t-1}$	-0.245***	0.024***	7.439**	1.635**	4.933**	0.104**
	(0.090)	(0.007)	(3.045)	(0.815)	(2.243)	(0.256)
$lt\_shareholdings_{t-1}$	0.211***	-0.025***	-0.860	-0.494	-1.116***	-0.638**
	(0.076)	(0.007)	(2.522)	(0.924)	(0.308)	(0.295)
Covariates?	Yes	Yes	Yes	Yes	Yes	Yes
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (adj)	0.228	0.440	0.088	0.065	0.421	0.111
Obs./# banks	5,791/833	5,791/833	1,485/339	1,485/339	2,004/414	2,004/414
			Panel B: 2SLS-IV estimates			
$st\_share\widehat{holdi}ngs_{t-1}$	-0.477***	0.530***	29.406**	6.964*	8.285*	3.182**
	(0.190)	(0.031)	(12.373)	(3.576)	(4.589)	(1.467)
$lt\_share\widehat{holdi}ngs_{t-1}$	0.761***	-0.029***	-15.362	-0.321	-7.575***	-2.073***
	(0.051)	(0.018)	(9.857)	(2.630)	(2.577)	(0.712)
Covariates?	Yes	Yes	Yes	Yes	Yes	Yes
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes
Observations/#banks	5,791/833	5,791/833	1,485/339	1,485/339	2,004/414	2,004/414

Table 7: Channels underlying horizon-risk nexus – managerial incentives

This table presents partial results of equation (2) estimated using ordinary least squares techniques in Panel A, and two-stage least squares instrumental variables techniques in Panel B. The dependent variable is captured by five measures of managerial incentives: *equity_pay*, *incentive_pay*, *delta*, *vega* and % *dividend*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. Each regression has missing observations due to the matching of different managerial incentive measures based on ExecuComp data with *investor horizon*. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. All variables are defined in Table 1.

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	*ln(equity_pay)*	*ln(incentive_pay)*	*ln(1+delta)*	*ln(1+vega)*	*% dividend*
Panel A: OLS estimates					
$st\_shareholdings_{t-1}$	1.915***	2.962***	2.642***	1.309**	0.219
	(0.562)	(0.942)	(0.456)	(0.450)	(0.380)
$lt\_shareholdings_{t-1}$	-2.879***	-2.656*	-2.587***	-1.823*	0.571**
	(0.856)	(1.392)	(0.878)	(1.038)	(0.275)
Covariates?	Yes	Yes	Yes	Yes	Yes
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes
R^2 (adj.)	0.382	0.460	0.497	0.534	0.064
Observations/#banks	1,529/200	1,536/200	1,536/200	1,429/200	5,791/833
Panel B: 2SLS-IV estimates					
$st\_\widehat{shareholdings}_{t-1}$	5.366**	6.952***	8.231***	21.730***	-2.686**
	(2.177)	(2.100)	(2.057)	(3.180)	(1.209)
$lt\_\widehat{shareholdings}_{t-1}$	-3.117***	-2.066**	-2.729***	-5.375***	2.578**
	(1.119)	(1.040)	(1.029)	(1.528)	(1.187)
Covariates?	Yes	Yes	Yes	Yes	Yes
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes
Observations/#banks	1,529/200	1,536/200	1,536/200	1,429/200	5,791/833

Table 8: *Investor horizon* and bank financial performance

This table presents partial results of equation (2) estimated using ordinary least squares techniques in Panel A, and two-stage least squares instrumental variables techniques in Panel B. The dependent variable is captured by six measure of bank financial performance: *stock returns, roa, roe, bhar, interest_margin, riskadj_returns*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. Each regression has missing observations due to the matching of alternative performance measures with *investor horizon*. All regressions include bank and year fixed effects. Robust standard errors are clustered at the bank level, and are displayed in parentheses below each coefficient estimate. *, **, *** represent statistical significance at the 10%, 5% and 1% level respectively. All variables are defined in Table 1.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable:	*stock returns*	*roa*	*roe*	*sizeadj_bhar*	*interest_margin*	*riskadj_returns*
Panel A: OLS estimates						
$st\_shareholdings_{t-1}$	-0.697***	0.0010	-0.0044	-0.307***	-0.002**	-13.191**
	(0.135)	(0.0015)	(0.00145)	(0.112)	(0.001)	(5.164)
$lt\_shareholdings_{t-1}$	0.924***	0.0057***	0.0759***	0.245****	0.003***	44.721***
	(0.096)	(0.0020)	(0.0160)	(0.0741)	(0.001)	(4.622)
Covariates?	Yes	Yes	Yes	Yes	Yes	Yes
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (adj.)	0.160	0.225	0.163	0.053	0.218	0.021
Observations/#banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833
Panel B: 2SLS-IV estimates						
$st\_share\widehat{holdi}ngs_{t-1}$	-7.720***	-0.0298***	-0.318***	-3.052***	-1.034**	-101.69***
	(0.643)	(0.005)	(0.049)	(0.397)	(0.421)	(18.00)
$lt\_share\widehat{holdi}ngs_{t-1}$	5.364***	0.0129	0.177	0.691*	0.315*	222.04***
	(0.309)	(0.015)	(0.191)	(0.373)	(0.171)	(10.61)
Covariates?	Yes	Yes	Yes	Yes	Yes	Yes
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes
Observations/#banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833

Table 9: *Investor horizon* and bank risk – Mediating role of *competition* and *shareholder rights*

This table presents selected results of ordinary least squares estimations of equation (4) in Panel A and of equation (5) in Panel B. The dependent variable is captured by seven alternative measure of bank risk. Each regression controls for seven covariates: *institutional shareholdings, ln(assets)*, *loan loss provision*, *charter value*, *non-interest income*, r*evenue growth,* and e*quity ratio*. *RSindex* is a bank competition index based on Rice and Strahan (2010, p.868) that ranges from zero (highly regulated) to four (deregulated) based on regulation changes in a state. *Eindex* (entrenchment index) is a measure of shareholder rights based on Bebchuck et al. (2009) and it ranges from zero to six, with higher values implying weaker shareholder rights. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	(1) *total risk$_t$*	(2) *idiosyncratic risk$_t$*	(3) *systematic risk$_t$*	(4) *tail risk$_t$*	(5) *ln(inverse Z-score)$_t$*	(6) *ln(distance-to-default)$_t$*	(7) *ln(actuarial spread)$_t$*
				Panel A: bank competition			
st_shareholdings$_{t-1}$	0.002	0.004	1.315***	0.021***	0.299**	1.319***	0.899***
	(0.005)	(0.004)	(0.196)	(0.004)	(0.102)	(0.442)	(0.294)
lt_shareholdings$_{t-1}$	-0.016***	-0.018***	0.650***	-0.006**	-0.515**	-1.049***	-0.705***
	(0.004)	(0.004)	(0.108)	(0.003)	(0.194)	(0.301)	(0.194)
RSindex$_t$	-0.0005***	-0.0002*	-0.018***	-0.001***	-0.015**	-0.012*	-0.009*
	(0.002)	(0.001)	(0.007)	(0.000)	(0.007)	(0.005)	(0.004)
RSindex$_t$×st_shareholdings$_{t-1}$	0.003**	0.002**	-0.161***	0.002*	0.067*	0.020**	0.024***
	(0.001)	(0.001)	(0.055)	(0.001)	(0.031)	(0.011)	(0.007)
RSindex$_t$×lt_shareholdings$_{t-1}$	0.003***	0.002**	0.215***	0.004***	0.080**	0.220***	0.130**
	(0.001)	(0.001)	(0.049)	(0.001)	(0.031)	(0.081)	(0.052)
R^2 (adj)	0.478	0.513	0.503	0.534	0.391	0.517	0.574
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833
				Panel B: shareholder rights			
st_shareholdings$_{t-1}$	0.017**	0.011	2.404***	0.037***	0.061**	2.273***	1.449***
	(0.008)	(0.008)	(0.454)	(0.007)	(0.03)	(1.001)	(0.645)
lt_shareholdings$_{t-1}$	-0.013**	-0.012**	0.096	-0.010**	-0.113**	-2.385***	-1.581***
	(0.006)	(0.005)	(0.362)	(0.006)	(0.051)	(0.853)	(0.529)
Eindex$_t$	-0.001***	-0.0009**	-0.017	-0.0004	-0.002*	-0.162**	-0.106**
	(0.000)	(0.004)	(0.026)	(0.0004)	(0.001)	(0.074)	(0.047)
Eindex$_t$× st_shareholdings$_{t-1}$	0.001	0.000	-0.387***	0.006**	0.120*	0.026**	0.007**
	(0.003)	(0.002)	(0.145)	(0.002)	(0.061)	(0.367)	(0.003)
Eindex$_t$× lt_shareholdings$_{t-1}$	0.004*	0.003**	0.117**	0.005**	0.026**	1.066***	0.671***
	(0.002)	(0.001)	(0.051)	(0.003)	(0.014)	(0.316)	(0.198)
R^2 (adj)	0.597	0.608	0.538	0.534	0.401	0.534	0.597
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833

Appendix: Comparison with Garel and Petit-Romec (2017), Livne et al. (2013) and Callen and Fang (2013)

Topics	Our study	Garel and Petit-Romec (2017)	Livne et al. (2013)	Callen and Fang (2013)
Focus	Examines both LT and ST institutional shareholdings influence on bank risk-taking. Also explores the effect of pre-crisis ST and LT shareholdings on crisis period risk and performance.	Explores only the effect of pre-crisis ST institutional shareholdings on crisis period bank performance and risk.	Investigates ST investment intensity effect on compensation, risk, and performance.	Studies the effect of institutional shareholders stability on future crash risk of non-bank firms.
Sample	833 banks with a total 5,791 bank-year observations.	419 banks/observations.	141 banks with 1,203 bank-year observations.	Exclusively non-bank firms with 66,727 firm-year observations.
Sample period	1991-2013	1997, 1998, 2006, 2007-2008	1994-2010	1981-2008
Estimation method/s	Three estimation methods: (1) OLS; (2) 2SLS-IV with Russell 1000/2000 index reconstitution, industry averages of ST and LT shareholdings, as three IVs; and (3) splitting LT shareholders between indexers and non-indexers based on Cremers and Petajisto (2009) "active share" measure of an investor's portfolio.	Two cross sectional methods: (1) cross-sectional regression; and (2) 2SLS-IV with average trading performance sensitivity 1 and average trading performance sensitivity 2, as two instruments.	Simultaneous equations or three-stage-least squares.	Three estimation methods: (1) OLS; (2) firm fixed-effects; and (3) 2SLS-IV.
Investor horizon proxies	Two proxies: (1) Churn ratio is used to classify institutional shareholders between ST and LT shareholders; and (2) Bushee (1998) classification.	One proxy: Churn ratio is used to classify institutional shareholders between ST and LT shareholders.	ST investment intensity is the ratio of trading assets and total of trading assets, available-for-sale assets, held-to-maturity securities, and loans.	Two proxies: (1) institutional owners persistence; and (2) Bushee (1998) classification.
Risk proxies	Seven different risk proxies: total, idiosyncratic, systematic, tail, Z-score, distance-to-default, actuarial spread.	Six different risk proxies: total, tail, Z-score, LLP, risk-weighted total assets, and real estate loans.	Total risk as a risk proxy.	Three crash risk proxies: the negative coefficient of skewness of daily returns, the down-to-up volatility of returns, and the difference between the number of days with negative extreme daily returns.
Channels				
Business policies?	Evidence that banks involve with conservative (aggressive) business policies with LT (ST) shareholdings. Six business policy variables include *core deposit ratio*, *NPL ratio*, *private MBS*	**NOT covered.**	**NOT covered.**	The relationship is more visible for firms with more opacity.

	ratio, *derivatives trading ratio*, *derivative hedging ratio*.			
Managerial incentives?	Evidence that banks offer less (more) equity-based compensation aligned with more (less) risk-taking with LT (ST) shareholdings. Four equity-based compensation include *equity pay*, *equity+option pay*, *delta*, and *vega*.	**NOT covered.**	Considers CEO compensation.	**NOT covered**
Performance?	Evidence that stock return increases (decreases) with LT (ST) shareholdings. Also reports that crisis period stock return decreases with pre-crisis period ST shareholdings.	Provides that crisis period stock return decreases with pre-crisis period ST shareholdings.	Presents that ROA decreases with ST investment intensity.	**NOT covered**
Mediating role of competition?	Evidence that bank competition lessens (deepens) the negative (positive) association between LT (ST) shareholdings and bank risk.	**NOT covered.**	**NOT covered.**	**NOT covered**
Mediating role of shareholder rights?	Evidence that strong shareholder rights strengthen (reduce) the less (more) risk-taking by LT (ST) shareholders.	**NOT covered.**	**NOT covered.**	**NOT covered**

Online Appendix (not for publication)

Institutional Investor Horizon and Bank Risk-taking

This online appendix provides some additional tables and figures that provide the details behind comments made in footnotes and text. Particularly, this appendix contains the following twelve items. First, Table OA.1 presents details on the sample construction process that lead to a final sample of 833 banks with 5,791 bank-year observations during 1991–2013. Second, Table OA.2 shows the top 10 institutional shareholders by investor horizon. Third, Table OA.3 tabulates the results for propensity score matching analysis. Fourth, Table OA.4 reports the results for alternative measures and non-linear effects of investor horizons. Fifth, Table OA.5 presents various results of sub-sample analysis. Sixth, Table OA.6 presents cross-sectional crisis period results of both risk and performance. Seventh, Table OA.7 shows investor horizon-riskiness relationship including observations from crisis periods, 2007-2009. Eighth, Table OA.8 presents the investor horizon-risk relationship incorporating eight additional CEO and board characteristics for a small sample of banks. Ninth, Table OA.9 reports additional results for alternative estimation method and sample. Tenth, Table OA.10 summarizes the key findings from our various analysis. Eleventh, Figures OA.1(A), and OA.1(B), illustrate sampling distributions across years and banks respectively. Finally, Figure OA.2(A) plots the time-series distribution of the mean churn rate of short-term and long-term shareholders and Figure OA.3(B) graphs the time-series distribution of the mean of shareholdings by short-term and long-term institutional shareholders.

Table OA.1: Details of sampling process

This table describes the sample construction process. Due to the lagged nature of the empirical model, some observations are lost because the independent variables must lag the dependent variables by one year. Institutional ownership data is from Thomson Reuters Institutional Holdings (13F) database; bank financial data is from the Federal Reserve Bank of Chicago; and market data is from CRSP.

Panel A: Sampling process

	Filter criteria	*# obs. removed*	*Remaining # obs.*	*# banks removed*	*Remaining # banks*
	Initial observations following merging data from CRSP, FRB Chicago, and 13F databases.		14,049		1,050
Remove:	Banks with insufficient information to construct the control variables, at least one risk variable and the investor horizon variables.	5,494	8,541	75	975
Remove:	Berger and Bouwman (2013) filter requiring (i) deposits and (ii) either commercial and industrial loans outstanding or loans secured by real estate.	14	8,408	1	974
Remove:	Bushee (1998) filter requiring observations without a minimum of 125 days of market data available each year.	133	8,408	10	964
Remove:	Bushee (1998) filter requiring firms with under 5% institutional shareholdings.	1,691	6,713	123	841
Remove:	Observations during GFC period [2007-2009]	922	5,791	8	833
		Final Sample	**5,791**		**833**

Panel B: List of banks appearing in all 20 years of our sample

1St Source Corporation	First Financial Bancorp	State Street Corporation
Arrow Financial Corporation	First Horizon National Corporation	Sterling Bancorp
Associated Banc-Corp	First Merchants Corporation	Suffolk Bancorp
Bank of America Corporation	Firstmerit Corporation	Suntrust Banks, Inc.
Bank of Hawaii Corporation	Fulton Financial Corporation	Susquehanna Bancshares, Inc.
Bryn Mawr Bank Corporation	Huntington Bancshares Incorporated	SYN Financial Group
Central Pacific Financial Corp.	JPMorgan Chase & Co.	Trustmark Corporation
City National Corporation	M&T Bank Corporation	U.S. Bancorp
Comerica Incorporated	Northern Trust Corporation	Washington Trust Bancorp, Inc.
Commerce Bancshares, Inc.	Old National Bancorp	Wells Fargo & Company
Community Bank System, Inc.	PNC Financial Services Group, Inc., The	Westamerica Bancorporation
Cullen/Frost Bankers, Inc.	Popular, Inc.	Zions Bancorporation
Fifth Third Bancorp	Seacoast Banking Corporation of Florida	

Table OA.2: Top 10 institutional shareholders by investor horizon

This table presents information on the top 10 largest institutional shareholders by investment horizon, ranked according to the amount invested in the sample of banks during 2013. It reports the mean stake held by each investor in the sample of banks as well as the churn rate on their total portfolio of stocks held, based on equation 1. Panel A lists the top 10 largest ST institutional shareholders. Panel B lists the top 10 largest LT institutional shareholders. Panel C lists information on the top 10 largest LT indexing institutional shareholders, ranked according to the amount invested in the sample of banks during 2013. It reports the average stake held by each investor in the sample of banks as well as the active share of their total portfolio, based on equation (5).

Panel A: Short-term institutional shareholders				
Rank	Investor Name	Amount Invested in Bank Sample ($m)	Mean Bank Stake (%)	Total Portfolio Churn Rate
1	Deutsche Bank	10,435	0.25	31.31
2	Goldman Sachs	9,012	0.87	24.67
3	Citigroup	6,879	0.10	31.34
4	Robeco Investment Management	5,651	0.85	23.88
5	Lord, Abbett & Co.	4,399	1.51	27.70
6	Credit Suisse Securities	4,391	0.16	29.16
7	Barclays Bank	4,233	0.04	38.52
8	Janus Capital Management	3,754	0.36	28.29
9	Putnam Investment Management	3,128	0.48	29.23
10	Schroder Investment Management	2,993	0.14	25.24
Panel B: Long-term institutional shareholders				
Rank	Investor Name	Amount Invested in Bank Sample ($m)	Mean Bank Stake (%)	Total Portfolio Churn Rate
1	BlackRock	150,400	4.43	6.62
2	Vanguard Group	68,668	3.11	4.42
3	State Street Corporation	65,103	2.58	4.22
4	Berkshire Hathaway	47,072	6.33	5.20
5	BNY Mellon	41,765	1.02	8.33
6	Northern Trust Corporation	27,739	1.42	4.89
7	Dodge & Cox	15,344	2.45	7.99
8	Barrow Hanley	11,890	2.24	8.83
9	Mitsubishi UFJ Financial Group	11,310	22.07	0.00
10	Dimensional Fund Advisors	9,826	2.52	5.59
Panel C: Long-term indexers				
Rank	Investor Name	Amount Invested in Bank Sample ($m)	Mean Bank Stake (%)	Active Share (%)
1	BlackRock	150,400	4.43	26.78
2	Vanguard Group	68,668	3.11	24.77
3	State Street Corporation	65,103	2.58	18.48
4	BNY Mellon	41,765	1.02	28.77
5	Northern Trust Corporation	27,739	1.42	21.97
6	Dimensional Fund Advisors	9,826	2.52	63.58
7	Geode Capital Management	9,654	0.39	15.45
8	Legal & General Group	6,017	0.27	14.37
9	New York State Common Retirement Fund	4,624	0.33	20.33
10	CALPERS	4,400	0.26	24.53

Table OA.3: *Investor horizon* and bank risk – *Propensity score matching*

This table shows the results of propensity score matching (PSM) analysis. Panel A presents the balance of six covariates (i.e., explanatory variables) both before and after the Kernel matching. The treatment group includes banks for which long-term shareholdings is greater than short-term shareholdings. It also shows the significant difference in seven alternative risk proxies both before and after the Kernel matching. Panel B presents the PSM matched OLS regression results of equation (2) for seven risk measures where *dominant_lt,* a proxy of investor horizon, is a dummy variable which equals one if *lt_shareholdings* is greater than *st_shareholdings* in a given year, otherwise zero. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: PSM univariate results

	Original Sample (Mean)			Kernel Matched Sample (Mean)		
Covariates and risk proxies	Treatment N= 4,109	Control N=1,682	Standardized Difference (%) [t-stats]	Treatment N= 4,109	Control N=1,682	Standardized Difference (%) [t-stats]
Covariate balancing:						
ln(assets)	14.72	14.63	5.8**[2.05]	14.75	14.75	-0.1[-0.06]
loan loss provision	0.13	0.12	6.0**[2.05]	0.13	0.13	-1.3[-0.55]
charter value	1.05	1.05	-7.2** [-2.52]	1.05	1.05	7.0**[2.81]
non-interest income	0.17	0.17	3.4 [1.20]	0.17	0.17	2.9 [1.21]
revenue growth	0.06	0.13	-34.1*** [-12.5]	0.08	0.08	-0.3 [-0.15]
equity ratio	0.09	0.09	5.2* [1.84]	0.09	0.09	-1.5 [-0.59]
ATT effect on risk:						
total risk	0.02	0.02	-0.00***[-3.47]	0.02	0.02	-0.00***[-4.15]
idiosyncratic risk	0.02	0.02	-0.00**[-4.02]	0.02	0.02	-0.00***[-4.13]
systematic risk	0.67	0.59	0.8**[4.73]	0.67	0.61	0.6***[3.22]
tail risk	0.01	0.01	-0.00*[-1.72]	0.01	0.01	-0.00***[-2.92]
ln(inverse Z-score)	-3.46	-3.34	-0.11***[-4.22]	-3.45	-3.34	-0.11***[-3.77]
ln(distance-to-default)	-4.47	-4.20	-0.27***[-9.07]	-4.48	-4.425	-0.23***[-7.01]
ln(actuarial spread)	3.95	4.17	-0.22***[-10.7]	3.94	4.12	-0.18***[-7.79]

Panel B: PSM regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	*total risk$_t$*	*idiosyncratic risk$_t$*	*systematic risk$_t$*	*tail risk$_t$*	*ln(inverse Z-score)$_t$*	*ln(distance-to-default)$_t$*	*ln(actuarial spread)$_t$*
dominant_lt$_{t-1}$	-0.001***	-0.001***	0.091***	-0.001***	-0.071***	-0.271***	-0.207***
	(0.000)	(0.000)	(0.009)	(0.000)	(0.022)	(0.019)	(0.013)
inst. shareholdings$_{t-1}$	-0.002***	-0.005***	0.675***	0.015***	-0.056	-0.352***	-0.348***
	(0.001)	(0.001)	(0.030)	(0.001)	(0.080)	(0.067)	(0.047)
ln(assets)$_{t-1}$	-0.002***	-0.002***	0.128***	0.002***	-0.034***	0.031***	0.039***
	(0.000)	(0.000)	(0.004)	(0.000)	(0.010)	(0.009)	(0.006)
loan loss provision$_{t-1}$	0.031***	0.029***	0.527***	0.017***	0.734***	1.630***	1.162***
	(0.001)	(0.001)	(0.025)	(0.001)	(0.068)	(0.056)	(0.040)
charter value$_{t-1}$	0.003*	-0.002	0.775***	0.030***	1.314***	-3.054***	-1.701***
	(0.002)	(0.002)	(0.069)	(0.002)	(0.182)	(0.151)	(0.107)
non-interest income$_{t-1}$	-0.001	-0.003***	0.046	-0.001	0.199*	-0.718***	-0.594***
	(0.001)	(0.001)	(0.041)	(0.001)	(0.111)	(0.089)	(0.063)
revenue growth$_{t-1}$	-0.005***	-0.005***	0.057**	-0.002***	0.567***	0.835***	0.690***
	(0.001)	(0.001)	(0.025)	(0.001)	(0.072)	(0.055)	(0.039)
equity ratio$_{t-1}$	-0.047***	-0.062***	1.392***	0.055***	-7.715***	-8.967***	-5.909***
	(0.004)	(0.004)	(0.167)	(0.004)	(0.438)	(0.370)	(0.263)
constant	0.048***	0.060***	-2.511***	-0.060***	-3.885***	-0.737***	5.876***
	(0.002)	(0.002)	(0.084)	(0.002)	(0.220)	(0.186)	(0.132)
R^2 (overall)	0.383	0.422	0.490	0.373	0.066	0.302	0.284
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833

Table OA.4: Alternative measures of *investor horizon* – Bushee (1998) measures and non-linear effects

This table presents partial results of ordinary least squares estimations of equation (2) using Bushee classification of investor horizon in Panel A and including quadratic terms of *st_shareholdings* and *lt_shareholdings* separately in Panels B and C, respectively. The dependent variable is captured by seven alternative measure of bank risk. Each regression controls for seven covariates: *institutional shareholdings, ln(assets)*, *loan loss provision*, *charter value*, *non-interest income*, r*evenue growth,* and e*quity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	(1) *total risk$_t$*	(2) *idiosyncratic risk$_t$*	(3) *systematic risk$_t$*	(4) *tail risk$_t$*	(5) *ln(inverse Z-score)$_t$*	(6) *ln(distance-to-default)$_t$*	(7) *ln(actuarial spread)$_t$*
Panel A: Bushee (1998) measures of investor horizon							
tran_shareholdings$_{t-1}$	0.002	0.004	1.315***	0.021***	0.299**	1.319***	0.899***
	(0.005)	(0.004)	(0.196)	(0.004)	(0.102)	(0.442)	(0.294)
qix_ded_shareholdings$_{t-1}$	-0.016***	-0.018***	0.650***	-0.006**	-0.515**	-1.049***	-0.705***
	(0.004)	(0.004)	(0.108)	(0.003)	(0.194)	(0.301)	(0.194)
R^2 (adj)	0.478	0.513	0.503	0.534	0.391	0.517	0.574
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833
Panel B: Non-linearity in *st_shareholdings*							
st_shareholdings$_{t-1}$	-0.015**	-0.019***	0.845***	0.019***	0.368	0.673	0.276
	(0.006)	(0.006)	(0.287)	(0.007)	(0.754)	(0.550)	(0.360)
(st_shareholdings)$^2_{t-1}$	0.064***	0.061***	-0.760	0.016	-0.976	0.036	0.403
	(0.020)	(0.020)	(0.968)	(0.023)	(0.051)	(1.864)	(1.219)
R^2 (adj)	0.486	0.478	0.395	0.485	0.284	0.527	0.592
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833
Panel C: Non-linearity in *lt_shareholdings*							
lt_shareholdings$_{t-1}$	0.006	0.000	2.215***	0.021***	-1.027	1.069**	0.749**
	(0.006)	(0.005)	(0.269)	(0.007)	(0.838)	(0.516)	(0.338)
(lt_shareholdings)$^2_{t-1}$	-0.044***	-0.026*	-5.516***	-0.072***	1.312	-5.411***	-3.554***
	(0.015)	(0.015)	(0.735)	(0.018)	(1.995)	(1.394)	(0.912)
R^2 (adj)	0.487	0.478	0.401	0.482	0.286	0.529	0.594
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833

Table OA.5: *Investor horizon* and bank risk – Subsample estimations

This table presents partial results of subsample estimations of equation (2) estimated using ordinary least squares techniques (column 1) and two-stage instrumental variable techniques (column 2). The dependent variable is always *total risk*. All three panels display the estimated coefficients on *st_shareholdings and lt_shareholdings*. Panel A subsamples the data for small banks and large banks (defined annually based on the median bank asset size in that year). Panel B subsamples the data for banks with low and high charter values (defined annually based on the median charter value in that year). Panel C subsamples the data before and after the global financial crisis. The sample encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. All regressions include bank and year fixed effects. Robust standard errors are clustered at the bank level, and are displayed in parentheses below each coefficient estimate. *, **, *** represent statistical significance at the 10%, 5% and 1% level respectively. All variables are defined in Table 1.

	(1) **OLS estimation**		(2) **2SLS-IV estimation**		
Dependent variable:	*total risk*		*total risk*		
Coefficients:	*st_shareholdings*	*lt_shareholdings*	$st\_\widehat{shareholdings}$	$lt\_\widehat{shareholdings}$	Obs
A. Subsample by asset size					
small banks	0.007	-0.003	0.091	-0.062	2895
	(0.07)	(0.004)	(0.058)	(0.175)	
large banks	0.009***	-0.011***	0.042**	-0.042***	2896
	(0.003)	(0.003)	(0.017)	(0.006)	
chi-square test (p-value)	12.74***(0.00)	4.15**(0.04)			
B. Subsample by charter value					
low charter value	0.004	-0.0001	0.0089	-0.011	2895
	(0.01)	(0.004)	(0.075)	(0.073)	
high charter value	0.0104***	-0.006**	0.023**	-0.018***	2896
	(0.004)	(0.003)	(0.009)	(0.005)	
chi-square test (p-value)	11.29***(0.00)	3.16*(0.08)			
C. Subsample by time					
pre-crisis (1993-2006)	0.007***	-0.005**	0.021	-0.239***	4642
	(0.002)	(0.002)	(0.018)	(0.025)	
post-crisis (2010-2013)	0.001	-0.009**	0.137**	-0.043***	1149
	(0.005)	(0.004)	(0.028)	(0.010)	
chi-square test (p-value)	5.34**(0.05)	8.53**(0.04)			

Table OA.6: 2007–2009 crisis period bank *riskiness* and *performance*

This table presents selected results of cross-section regression analysis of equation (6). The dependent variable ($y_{i,2007\text{-}2008}$) is captured by seven alternative measures of bank *risk*, each measured as an average between in 2007–2009 in Panel A and six *performance* proxies, each measured as an average between 2007–2009 in Panel B. $risk_{1998}$ and $risk_{2006}$ are bank risk proxy measured in 1998 and 2006 respectively. $return_{1998}$ and $return_{2006}$ are financial performance proxy measured in 1998 and 2006 respectively. Each regression controls for seven covariates measured in 2006: *institutional shareholdings,* l*n(assets)*, *loan loss provision*, *charter value*, *non-interest income*, r*evenue growth,* and e*quity ratio*. All variables are defined in Table 1. Robust standard errors are in parentheses. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: y_{it} = $risk_{2007\text{-}2009}$							
Dependent variable:	*total risk$_t$*	*idiosyncratic risk$_t$*	*systematic risk$_t$*	*tail risk$_t$*	*ln(inverse Z-score)$_t$*	*ln(distance-to-default)$_t$*	*ln(actuarial spread)$_t$*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$st\_shareholdings_{2006}$	0.0025***	0.052***	1.864***	0.081***	2.19**	3.74*	0.573**
	(0.07)	(0.007)	(0.294)	(0.01)	(1.11)	(2.16)	(0.235)
$lt\_shareholdings_{2006}$	-0.029***	-0.032***	1.471***	-0.01	-2.581**	-1.634**	-0.238*
	(0.007)	(0.004)	(0.412)	(0.01)	(1.29)	(0.815)	(0.129)
$risk_{1998}$	0.025	0.014	0.125*	0.026*	0.003	1.87	0.210
	(0.017)	(0.022)	(0.07)	(0.003)	(0.015)	(0.94)	(0.151)
$risk_{2006}$	0.98***	0.95***	0.159*	0.624*	0.587**	0.184**	0.739*
	(0.32)	(0.29)	(0.08)	(0.37)	(0.242)	(0.09)	(0.431)
Covariates?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.235	0.240	0.172	0.258	0.09	0.214	0.183
Observations	289	289	289	289	289	289	289

Panel B: y_{it} = $performance_{2007\text{-}2009}$						
Dependent variable:	*stock returns*	*roa*	*roe*	*sizeadj_bhar*	*interest_margin*	*riskadj_returns*
$st\_shareholdings_{t-1}$	-1.62***	-0.002**	-0.017	-1.62***	-1.62***	-11.95*
	(0.54)	(0.000)	(0.001)	(0.54)	(0.54)	(6.37)
$lt\_shareholdings_{t-1}$	1.10**	0.002***	0.019**	1.10**	1.10**	3.55
	(0.29)	(0.001)	(0.008)	(0.29)	(0.29)	(4.39)
$performance_{1998}$	0.69***	-0.0003	0.38**	0.69***	0.69***	0.25***
	(0.27)	(0.0008)	(0.21)	(0.27)	(0.27)	(0.09)
$performance_{2006}$	-0.28	0.002***	-0.021***	-0.28	-0.28	-0.12
	(0.43)	(0.000)	(0.001)	(0.43)	(0.43)	(0.10)
Covariates?	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.041	0.103	0.078	0.041	0.041	0.132
Observations	314	314	314	314	314	314

Table OA.7: *Investor horizon* and bank risk factoring crisis periods

This table presents partial results of ordinary least squares estimations of equation (2) factoring crisis period. Particularly, Panel A shows the results for analysis replicating those in Table 3 using a "whole sample" including observations from crisis period. Panel B presents the results analysing equation (2) by incorporating crisis period dummy (*gfc*) and two interaction terms, *st_shareholdings×gfc, lt_shareholdings×gfc*. Panel C reports the results for crisis period sample, i.e., observations in 2007-2009 period. The dependent variables measure seven different risks. Each regression controls for seven covariates: *institutional shareholdings,* l*n(assets)*, *loan loss provision*, *charter value*, *non-interest income*, r*evenue growth,* and e*quity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable:	(1) *total risk$_t$*	(2) *idiosyncratic risk$_t$*	(3) *systematic risk$_t$*	(4) *tail risk$_t$*	(5) *ln(inverse Z-score)$_t$*	(6) *ln(distance-to-default)$_t$*	(7) *ln(actuarial spread)$_t$*
Panel A: Including crisis-period observations							
st_shareholdings$_{t-1}$	0.017***	0.021***	1.09***	0.035***	0.91**	0.810**	1.361
	(0.007)	(0.005)	(0.131)	(0.012)	(0.35)	(0.349)	(0.879)
lt_shareholdings$_{t-1}$	-0.016***	-0.013***	0.514***	-0.011**	-1.562**	-0.573***	-0.215**
	(0.003)	(0.003)	(0.152)	(0.005)	(0.762)	(0.205)	(0.104)
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (overall)	0.491	0.483	0.480	0.535	0.427	0.396	0.572
Obs./# banks	6,713/841	6,713/841	6,713/841	6,713/841	6,713/841	6,713/841	6,713/841
Panel B: Impact during crisis-period							
st_shareholdings×gfc	0.0034*	0.005*	0.219**	0.0235***	0.210*	0.043**	0.0310
	(0.002)	(0.003)	(0.105)	(0.013)	(0.115)	(0.021)	(0.019)
lt_shareholdings×gfc	-0.015***	-0.004*	1.549***	-0.013	-0.728**	-0.003*	-0.152**
	(0.003)	(0.002)	(0.113)	(0.015)	(0.347)	(0.002)	(0.084)
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (overall)	0.569	0.580	0.551	0.560	0.455	0.437	0.601
Obs./# banks	6,713/841	6,713/841	6,713/841	6,713/841	6,713/841	6,713/841	6,713/841
Panel C: Only crisis-period observations (2007-2009)							
st_shareholdings$_{t-1}$	0.017*	0.014*	0.077	0.023**	1.01*	0.500**	0.164
	(0.009)	(0.009)	(0.289)	(0.011)	(0.591)	(0.242)	(0.250)
lt_shareholdings$_{t-1}$	-0.014**	-0.009**	3.226***	-0.014**	-0.726*	-0.745**	-0.112**
	(0.006)	(0.004)	(0.194)	(0.006)	(0.415)	(0.351)	(0.052)
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (overall)	0.483	0.499	0.581	0.563	0.472	0.469	0.580
Obs./# banks	885/354	885/354	885/354	885/354	885/354	885/354	885/354

Table OA.8: *Investor horizon* and bank risk including CEO traits and board structure

This table presents the results of equation (2) estimated using ordinary least squares techniques adding three CEO traits (*ln*(*tenure)*, *age*) and three board related characteristics (*ln(board size)*, *ln(independent directors)*, *female*). All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The data includes 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	*total risk*$_t$	*idiosyncratic risk*$_t$	*systematic risk*$_t$	*tail risk*$_t$	*ln(inverse Z-score)*$_t$	*ln(distance-to-default)*$_t$	*ln(actuarial spread)*$_t$
st_shareholdings$_{t-1}$	0.015***	0.009**	0.937***	0.036***	0.092	0.026**	0.630**
	(0.004)	(0.004)	(0.279)	(0.008)	(0.225)	(0.012)	(0.337)
lt_shareholdings$_{t-1}$	-0.025***	-0.028***	0.555*	0.002*	-0.396	-0.063***	-0.219***
	(0.007)	(0.007)	(0.283)	(0.001)	(0.330)	(0.018)	(0.048)
inst. shareholdings $_{t-1}$	-0.000	-0.000	0.035	0.001	0.008	-0.020	-0.341
	(0.002)	(0.003)	(0.028)	(0.002)	(0.013)	(0.572)	(0.397)
ln(assets)$_{t-1}$	0.000	-0.000	0.095***	0.002***	-0.007	0.005***	0.158***
	(0.000)	(0.000)	(0.020)	(0.001)	(0.021)	(0.001)	(0.027)
loan loss provision $_{t-1}$	0.022***	0.015***	0.451**	0.028***	0.336	0.033**	0.587*
	(0.004)	(0.003)	(0.197)	(0.008)	(0.214)	(0.013)	(0.335)
charter value $_{t-1}$	0.027***	0.020***	0.726***	0.043***	2.007***	0.026	0.885*
	(0.004)	(0.004)	(0.251)	(0.008)	(0.290)	(0.018)	(0.490)
non-interest income$_{t-1}$	0.001	0.002	0.426**	-0.003	0.150	-0.009	-0.115
	(0.003)	(0.003)	(0.169)	(0.005)	(0.161)	(0.007)	(0.188)
revenue growth $_{t-1}$	0.001	0.004**	-0.095	-0.006**	-0.350***	0.032***	0.985***
	(0.002)	(0.002)	(0.102)	(0.003)	(0.114)	(0.007)	(0.166)
equity ratio $_{t-1}$	-0.093***	-0.086***	-0.273	-0.053**	-3.589***	-0.180***	-4.547***
	(0.017)	(0.016)	(0.887)	(0.026)	(0.824)	(0.054)	(1.479)
power	-0.001	-0.001	-0.014	0.000	0.024	-0.004	-0.081
	(0.001)	(0.001)	(0.030)	(0.001)	(0.026)	(0.003)	(0.067)
ln(tenure)	0.000	0.000	-0.008	-0.000	0.011	0.002**	0.062**
	(0.000)	(0.000)	(0.020)	(0.001)	(0.020)	(0.001)	(0.027)
age	0.000	0.000	0.005	0.000	-0.000	0.000	0.001
	(0.000)	(0.000)	(0.003)	(0.000)	(0.003)	(0.000)	(0.004)
ln(board size)	0.003***	0.002**	-0.026	0.004**	-0.068	0.006*	0.173**
	(0.001)	(0.001)	(0.061)	(0.002)	(0.045)	(0.003)	(0.088)
ln(indep_directors)	-0.002*	-0.001	-0.143*	-0.001	0.022	0.006	0.172*
	(0.001)	(0.001)	(0.084)	(0.002)	(0.060)	(0.003)	(0.091)
female	-0.000	0.000	-0.018	-0.000	0.003	-0.000	-0.019
	(0.000)	(0.000)	(0.016)	(0.000)	(0.015)	(0.001)	(0.020)
constant	-0.015**	0.002	-1.597***	-0.073***	-5.016***	-0.070***	-2.252***
	(0.007)	(0.007)	(0.443)	(0.012)	(0.436)	(0.025)	(0.679)
Bank and Year FE?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2 (overall)	0.287	0.299	0.293	0.331	0.299	0.300	0.361
Obs./# banks	1,425/135	1,425/135	1,425/135	1,425/135	1,425/135	1,425/135	1,425/135

Table OA.9: *Investor horizon* and bank risk – Alternative estimation method and sample

This table presents partial results of equation (2) estimated using first-difference method in Panel A, controlling for state-fixed effects in Panel B, controlling for federal reserve fixed-effects in Panel C, for a balance sample in Panel D, and for a sample excluding globally systematically important banks in Panel E. The dependent variable is captured by seven alternative measure of bank risk. Each regression controls for seven covariates: *institutional shareholdings, ln(assets)*, *loan loss provision*, *charter value*, *non-interest income*, r*evenue growth,* and e*quity ratio*. All variables are defined in Table 1. All continuous variables are winsorized at the 1st and 99th percentiles. The sample generally includes encompasses 5,791 bank-year observations of 833 U.S. listed commercial banks from 1991-2013, excluding the financial crisis years of 2007-2009 in all Panels except for Panel D and E.. All regressions include bank and year fixed effects. Robust standard errors in parentheses are clustered at the bank level. *, **, *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:	*total risk$_t$*	*idiosyncratic risk$_t$*	*systematic risk$_t$*	*tail risk$_t$*	*ln(inverse Z-score)$_t$*	*ln(distance-to-default)$_t$*	*ln(actuarial spread)$_t$*
Panel A: First-difference analysis							
st_shareholdings$_{t-1}$	0.008***	0.003**	0.312**	0.015***	0.118**	0.028**	0.293**
	(0.004)	(0.001)	(0.140)	(0.004)	(0.005)	(0.013)	(0.109)
lt_shareholdings$_{t-1}$	-0.0014**	-0.003*	0.119**	-0.012***	-0.221*	-0.024**	-0.244**
	(0.0006)	(0.002)	(0.06)	(0.004)	(0.124)	(0.010)	(0.093)
R^2 (adj)	0.232	0.196	0.155	0.354	0.078	0.193	0.393
Obs./# banks	4,643/734	4,643/734	4,643/734	4,643/734	4,643/734	4,643/734	4,643/734
Panel B: State fixed-effects							
st_shareholdings$_{t-1}$	0.004**	0.003**	0.801***	0.022***	0.139**	0.933***	0.585***
	(0.002)	(0.001)	(0.160)	(0.003)	(0.07)	(0.285)	(0.184)
lt_shareholdings$_{t-1}$	-0.008***	-0.012***	1.119***	-0.015**	-0.197**	-0.492*	-0.380**
	(0.003)	(0.003)	(0.134)	(0.002)	(0.08)	(0.272)	(0.169)
R^2 (adj)	0.489	0.525	0.519	0.543	0.426	0.523	0.590
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833
Panel C: Federal fixed-effect							
st_shareholdings$_{t-1}$	0.001**	0.002**	0.854***	0.022***	0.185**	0.958***	0.622***
	(0.000)	(0.001)	(0.151)	(0.003)	(0.092)	(0.288)	(0.189)
lt_shareholdings$_{t-1}$	-0.008***	-0.012***	1.150***	-0.015***	-0.211*	-0.557**	-0.422**
	(0.003)	(0.003)	(0.134)	(0.002)	(0.120)	(0.270)	(0.169)
R^2 (adj)	0.481	0.519	0.506	0.536	0.394	0.525	0.582
Obs./# banks	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833	5,791/833
Panel D: Balanced sample							
st_shareholdings$_{t-1}$	0.0002**	0.005**	1.602***	0.026***	0.030**	0.516*	0.302**
	(0.005)	(0.002)	(0.198)	(0.004)	(0.013)	(0.285)	(0.147)
lt_shareholdings$_{t-1}$	-0.005*	-0.006**	0.731***	0.003	-0.622*	-0.183**	-0.093*
	(0.003)	(0.003)	(0.167)	(0.004)	(0.330)	(0.089)	(0.051)
R^2 (adj)	0.502	0.504	0.509	0.588	0.351	0.529	0.611
Obs./# banks	3,022/205	3,022/205	3,022/205	3,022/205	3,022/205	3,022/205	3,022/205
Panel E: Excluding globally-systematically important banks (GSIBS)							
st_shareholdings$_{t-1}$	0.005***	0.002**	0.941***	0.024***	1.23**	0.941**	0.213*
	(0.002)	(0.001)	(0.093)	(0.002)	(0.41)	(0.534)	(0.191)
lt_shareholdings$_{t-1}$	-0.008**	-0.012***	1.174***	-0.016**	-0.942***	-0.692**	-0.374*
	(0.002)	(0.002)	(0.088)	(0.002)	(0.321)	(0.315)	(0.219)
R^2 (adj)	0.477	0.513	0.493	0.520	0.382	0.497	0.545
Obs./# banks	5,687/828	5,687/828	5,687/828	5,687/828	5,687/828	5,687/828	5,687/828

Table OA.10: ***Summary of main findings***

	Table	*st_shareholdings*	*lt_shareholdings*
Dependent variable = Risk proxies			
Main sample excluding crisis period	3	"+"	"-"
Whole sample including crisis period	OA.7	"+"	"-"
Crisis period sample	OA.7	"+"	"-"
Pre-crisis period sample	OA.5	"+"	"-"
Post-crisis period sample	OA.5	"+"	"-"
Impact of crisis period	OA.6	"+"	"-"
Shareholders' rights×investor_horizons	9	"+"	"+"
Bank competition×investor_horizons	9	"+"	"+"
Small banks sample	OA.5	No association	No association
Large banks sample	OA.5	"+"	"-"
Low charter value banks sample	OA.5	No association	No association
High charter value banks sample	OA.5	"+"	"-"
Dependent variables as listed below			
Conservative business activities?	6	"No"	"Yes"
Risk-taking incentive base pay proxies	7	"+"	"-"
Bank performance proxies	8	"-"	"+"

Figure OA.1(A): Annual distribution of bank-year observations

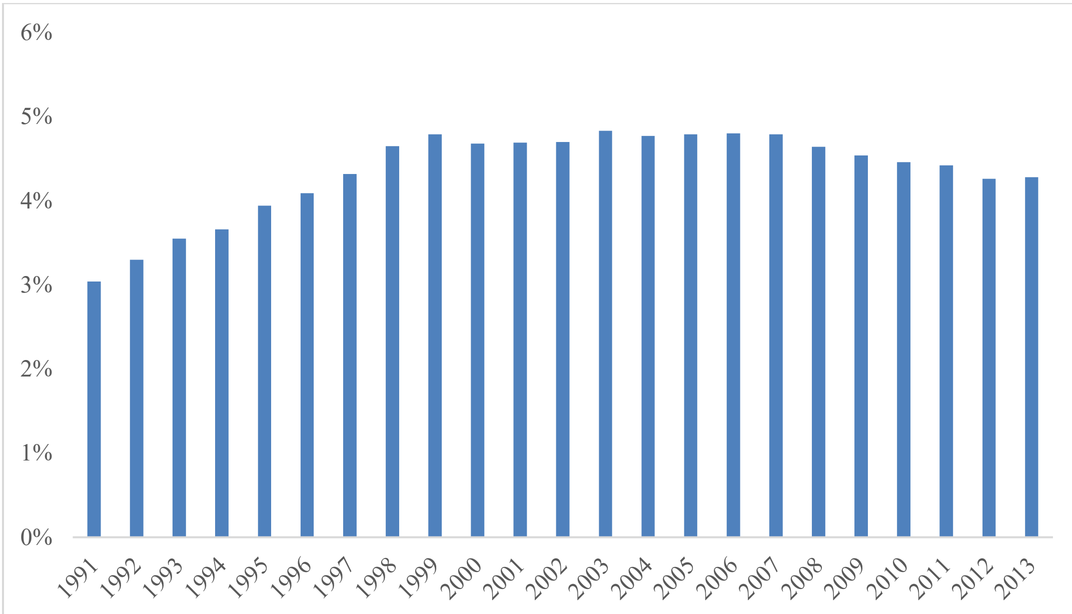

Figure OA.1(B): Annual frequency of bank-year observations

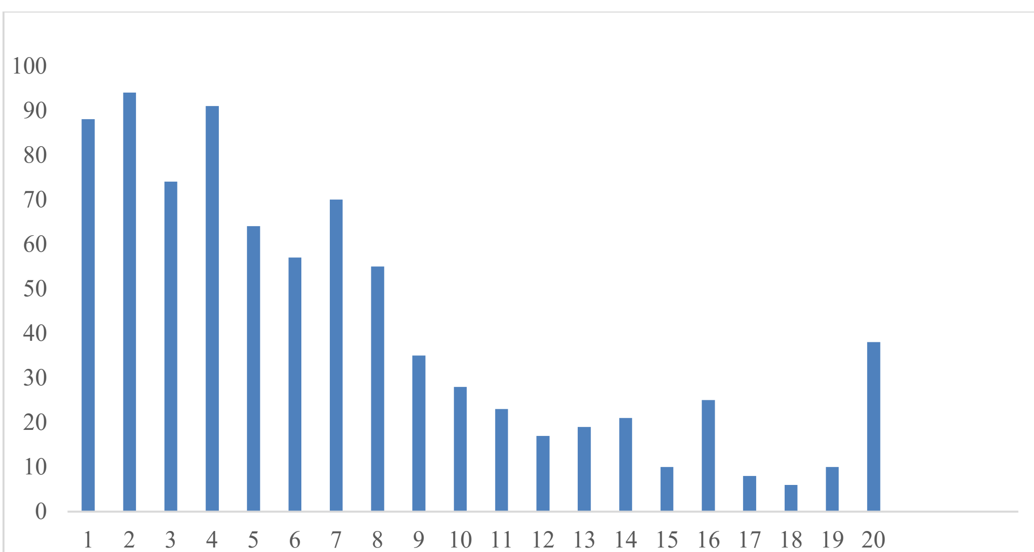

Figure OA.2(A): Mean churn rate of ST and LT institutional shareholders between 1991 and 2013

This figure plots the mean churn rate of ST and LT shareholders between 1991 and 2013. The churn rate is computed each quarter following equation (1) and averaged over past four quarters. This churn rate measures the frequency of each investor's portfolio turnover. As per the work of Yan and Zhang (2009), shareholders that fall within the bottom tertile of the average churn rate are categorized as ST shareholders, while shareholders at the top tertile of the average churn rate are categorized as LT shareholders.

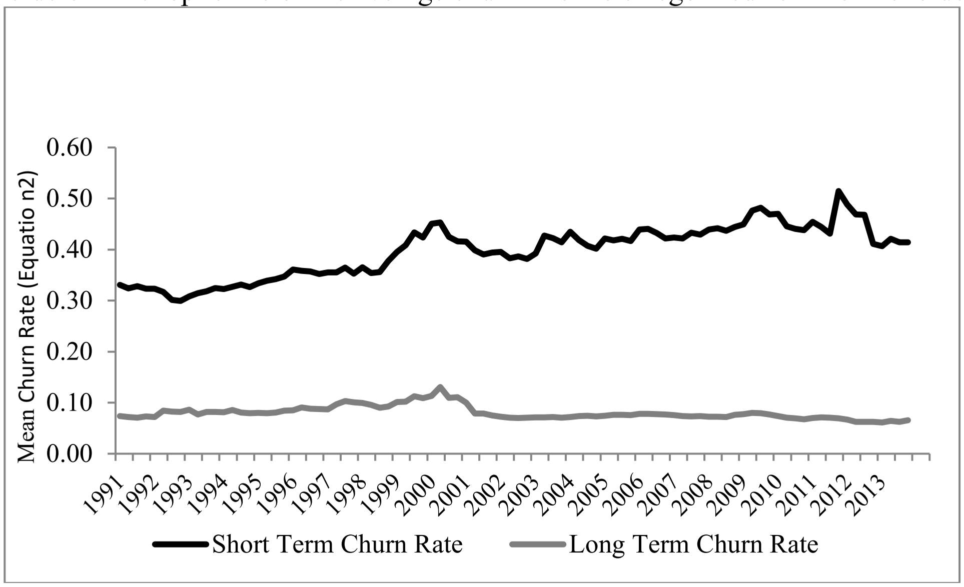

Figure OA.2(B): Mean ST and LT institutional shareholdings between 1991 and 2013

This figure presents mean ST and LT investor shareholders each quarter between 1991 and 2013. As per the work of Yan and Zhang (2009), shareholders that fall within the bottom tertile of the average churn rate are categorized as ST shareholders while shareholders at the top tertile of the average churn rate are categorized as LT shareholders. The churn rate is computed each quarter following equations (1) and averaged over past four quarters.