Putting Skin in the Game:
Managerial Ownership and Bank Risk-Taking

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ABSTRACT This paper examines the relation between managerial ownership and bank risk exposure for a large sample of international financial institutions. We argue that managers holding equity of their bank take less risk because they have fewer opportunities to diversify risk compared with outside shareholders. Our findings are consistent with this idea. We document lower risk levels for banks that employ bank managers with higher equity stakes. Our evidence also suggests that external shareholders affect risk taking via directors representing their interests. We also find that regulation hardly affects the risk-taking of bank managers holding on their bank's shares.

Keywords: Managerial equity ownership, financial risk, corporate governance, banks

JEL codes: G20; G32; G34

1. Introduction

We examine whether bank managers holding a fraction of the equity of their bank are inclined to take on the same level of risk as outside shareholders. Laeven and Levine (2009) demonstrate that outside owners have incentives to increase bank risks. Large outside shareholders can affect risk-taking, as they often have a deciding vote in major appointments and managerial compensation (e.g., Shleifer and Vishny 1986; Cai, Garner, and Walkling 2009). Levine (2004) argues that "large shareholders can elect their representatives to the board of directors and thwart managerial control of the board of directors." Bolton, Mehranz, and Shapiro (2011) argue that shareholders can exploit distortions introduced by either deposit insurance or naive debt holders and that the riskiness of debt provides shareholders with incentives to (inefficiently) shift risk from equity to debt holders. Bank leverage levels make it very attractive to shift risk from shareholders to debt holders. While for banks 90 to 95 percent of the balance sheet is debt, the nonfinancial firms' debt averages merely 40 percent (Bolton et al. 2011). Any increase in bank debt therefore has a larger impact on the share-price volatility than increases in the debt of nonfinancial firms have. Bolton et al. (2011) and Levine (2004) argue that shareholders are inclined to design incentive systems that lead bank managers to seek high levels of risk. Managers ready to assume these risk levels also have the opportunity to alter the risk composition of their assets more quickly than most nonfinancial industries, and "can readily hide problems by extending loans to clients that cannot service previous debt obligations" (Levine 2004, p.3). We argue that equity stakes mitigate risk-taking by bank managers. This is because bank manager-owners have fewer opportunities to protect their wealth against risk than well-diversified (outside) shareholders (e.g., Jin 2001 and Zhou 2001). This motivates these less

diversified managers to seek projects with lower risk levels, which is the main conjecture tested in this study.

While equity holdings may lead managers to mitigate risk, it is unclear how regulation affects managers' behavior. Managers may feel better protected when their banking activities are subjected to increased levels of monitoring and regulation. As a consequence, these managers may consider events affecting their value asymmetrically: negative events have less value-reducing effects than similarly sized positive events. For this reason we argue that regulation is likely to prompt bank managers to increase risks.

To test these two conjectures we employ a sample of 307 banks from all over the world and provide a level of detail in our ownership data that allows an in-depth analysis of the association between risk incentives and managerial ownership. Our results suggest that the level of managerial ownership is negatively related to the risk exposure in banks. Specifically, we demonstrate that for the majority of internal shareholder observations—90 percent of our sample—higher levels of equity holdings are associated with more bank stability and lower stock return volatility. We find that only very large internal shareholders—10 percent of our sample—act as outside shareholders do, in that their banks take more risk, supporting results of Laeven and Levine (2009). For a 1 percent increase of managerial ownership in the bank, we demonstrate that the bank has a 6 percent lower risk level. In addition, we find that the shareholder return for these banks is 8 percent better during the recent financial crisis.

We observe an important divide between outside and inside shareholders relating to the effect of regulation. Specifically, we reproduce the results of Laeven and Levine (2009), finding that outside large shareholders motivate banks to take on ever-greater risks as regulation increases. We extend their results in that we demonstrate that state ownership and bank risk

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taking are positively associated. This is *not* the case for manager-shareholders. We find only weak evidence to support the idea that owner-managers exposed to tougher capital requirements take more risks than managers who do not own equity. Our results suggest that outside shareholders are more willing to push banks into riskier business than are banks managers, even when those managers own their bank's equity.

Our study contributes to the literature in several ways. Our findings extend those of Beltratti and Stulz (2012) who document that banks with more shareholder-friendly boards performed worse during the financial crisis than other banks and were not less risky before the crisis. Consistent with these results, Laeven and Levine (2009) argue that large shareholders often have a deciding vote on a bank's governance structure. Their conclusion implies that a shareholder-friendly board might encourage risk-taking. We extend these findings by showing one of the underlying mechanisms in that we demonstrate that the large shareholders typically put directors on the board. We find that those banks that have such directors on the board do take on more risks. On the other hand we demonstrate that banks employing managers who hold equity took less risk before the financial crisis and performed better during it. This suggests that the employment by banks of this kind of manager may check the inclination of large shareholders to seek higher levels of risk.

Our paper also speaks to Hall and Murphy (2002) and Cheng, Hong and Scheinkman (2013). Hall and Murphy (2002) argue that the provision of equity incentives to firm managers exposes these managers to unsystematic risks. We present a situation where this is arguably true as we observe in the data that relative equity holdings of bank managers hardly change over time. This approach provides a unique ability to examine the relationship between risk-taking and return. Cheng et al. (2013) seek to explain how management risk exposure is related to

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compensation contract design. In their study managerial ownership it is considered to constitute a risk factor for which the firm should compensate the manager. In our study we examine whether equity incentives are associated with managerial risk taking. We argue that, controlling for variable pay, the risk of losing this value altogether leads managers to take on lower risks.

Laeven and Levine (2009) demonstrate that the first order-effect of stringent regulation would lead banks to decrease risks. But the protection provided by that regulation then leads risk-seeking (large) outside shareholders to take push for the bank to take on even higher levels of risk. These shareholders can affect bank risk-taking because they can have a deciding vote on major appointments and managerial incentives. Thus regulation can backfire with banks that have (large) shareholders who benefit from increased risk-taking. While Laeven and Levine (2009) emphasize how *external* shareholders direct banks to higher risk levels, our paper takes issue with *shareholder-managers'* risk-taking. Saunders et al. (1990) advance similar arguments for manager-shareholders. However, their analysis emphasizes the effect of large shareholders, while our analysis –given that a small percentage represents a large amount of money- also examine smaller shareholding representations of bank mangers. We find little evidence to suggest that manager-shareholders are equally inclined to expose the bank to more risk when regulation becomes more restrictive.

We address potential endogeneity issues by taking advantage of an exogenous shock. Recent research finds support for the idea that higher levels of equity-based wealth, which is sensitive to stock-price return volatility (higher vega), leads managers to take more risk, while, in cases where wealth depends more on the stock price (higher delta), managers are inclined to take less risk (Coles, Naveen, and Daniel 2006; Chava and Purnanandam 2010). Cheng, Hong and Scheinkman (2013) have added to this literature by taking the position that firms that expose

their managers to stock price volatility should compensate their managers for bearing these risks. They demonstrate that managers that are incentivized with ownerships staked who work at riskier firms are compensated for their exposure to higher risks. We take a different perspective. We conjecture that the very fact that managers are holding on to shares of the bank, leads them to protect their wealth by taking on lower risk levels. To test this hypothesis we examine long-term risk taking (Laeven and Levine 2009) rather than short-term stock volatility measures of risk. Unlike Coles, Naveen and Daniel (2006) and Chava and Purnanandam (2010), we examine risk-taking before and during a systemic financial crisis to assess how banks with managers incentivized to take higher (lower) levels of risk perform.

The remainder of the paper is as follows. Section 2 reviews the literature and provides theoretical arguments underlying our predictions. Section 3 explains our sample, model design, and variable definitions. Section 4 assesses how bank risk varies with managerial ownership structures. Section 5 concludes.

2. Theory and predictions

Shareholders want the firm they own to survive. But it is not clear whether their incentives would, in fact, lead them to condition the present value of the firm on the likelihood of survival: To the extent that business choices enhance the present value of a firm's future economic profit, they might want to increase that value even at the cost of a higher default risk. Laeven and Levine (2009) argue that diversified owners tend to advocate for more bank risk taking than managers because the latter are more likely to suffer from a potential bankruptcy given their bank-specific skills. They document that bank risk is generally higher in banks that have large owners with substantial cash flow rights. In a follow-up study, Gropp and Köhler

(2010) document that owner-controlled banks realize higher profits before the crisis but that their losses are larger during the crisis. Both studies suggest that shareholder influence may reduce the likelihood of firm survival. Beltratti and Stulz (2012) demonstrate that banks with shareholder-friendly boards perform worse during the crisis than other banks.

Based on these results, one might conclude that equity incentives lead bank managers to take risks consistent with shareholders' preferences. However, there are marked differences between bank managers who own a small fraction of the firm's equity and large (block) shareholders. Given that the latter are often institutional investors, they can diversify their risk. This is much less likely for bank managers who hold shares of their bank. For them, owning bank shares means assuming risk that they cannot diversify. Hall and Murphy (2000) argue in this regard that using Black-Scholes (1973) to value employee stock options typically overstates the value that these options have to the manager because option pricing theory assumes that options are freely tradable and the option holders can hedge the risk by short selling stock. Stock held by bank managers satisfies neither of these assumptions. Given insiders' exposure to risk, they may want to reduce firm-specific risk by underinvesting in projects that increase firm risk and overinvesting in risk-reducing activities (Jensen, Murphy, and Wruck 2004). Jin (2002) recognizes this possibility in his study. He proposes that internal shareholders who cannot diversify their portfolios are likely to be offered compensation contracts featuring lower levels of pay-performance sensitivity compared with managers who own little equity of their own firms. He finds results consistent with this prediction.

Gao (2010) points out that insiders are not allowed to sell firm equity they own, so their diversification opportunity arises with the availability and tradability of put options. Zhou (2001) demonstrates that internal shareholder ownership changes little over time. For 60 (73.9) percent

of the managers who own more than 1 percent (more than 10 percent) of the shares, the change in ownership is less than 10 percent of their equity holding per year. This result suggests that these internal shareholders are, in practice, exposed to considerable systematic risk. We argue below that their undiversified risk exposure leads managers to take less risk (Smith and Stulz 1985).

Our argument for managers taking less risk runs as follows. Assume that an outside shareholder and a bank manager consider the same business opportunity. (1) The shareholder and manager calculate the same probability distribution for the financial outcome from the business opportunity. (2) With the initial opportunity intact, an exogenous shock presents the chance to embark on a riskier business opportunity, leading both the manager and shareholders to raise their estimated outcome variance by an identical amount from period t to period t + 1. (3) The manager and shareholder are equally risk averse and (4) each bases his or her decision to approve or reject the business opportunity on a calculation of the certainty equivalent (expressed in terms of personal wealth) for the opportunity. (5) The manager stands to lose more than the shareholder when a negative scenario unfolds—that is, the shareholder can diversify the risk, while the manager is much less able to do so.[1,2]

Indeed, the equity incentive literature provides evidence that is consistent with the idea that manager-shareholders are less likely to take risk compared with outside shareholders. Smith and Stulz (1985) predict a negative (cross sectional) association between compensation structure

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[1] One could argue that entrenched managers have equal incentives to avoid risk taking so as to protect their bank-specific human capital. However, while entrenched managers find it hard to leave their bank, they will consider the wealth effect of their decisions even more if they stand to lose the value of the bank shares they own. In that case, they not only lose the discounted value of the specific human capital if they make adverse decisions, they also lose the share price drop that is the consequence of their risk-taking.

[2] We abstract in this study from the phenomenon of empire building whereby firms with high free cash flows and low investment opportunities have incentives to grow beyond their optimal size (Jensen, 1986). For instance, Masulis, Wang, and Xie (2007) show that managers less protected against takeovers are more likely to resort to empire building. We argue that equity incentives curb the extent to which managers have incentives to indulge in empire building in that investing the free cash flow in substandard projects would hurt their wealth.

and overall risk-taking. They assume that managers are risk averse and evaluate opportunities against strictly concave indirect utility functions of wealth. In this model, the manager's wealth comprises financial compensation and the payoff to his or her human-capital investment in the firm. Consequently, the firm's total cash flow volatility is transmitted to the manager's wealth volatility. Tufano (1996) and Schrand and Unal (1998) find evidence that is consistent with the idea that managers with less diversifiable equity portfolios take lower risks. For firms in the gold-mining industry Tufano (1996) finds that managers who hold equity (equity options) are more (less) likely to manage gold price risks. Schrand and Unal (1998) find for a sample of thrift conversions that institutions with greater managerial shareholdings significantly decrease total risk following conversion. Mehran, Nogler, and Schwartz (1998) demonstrate that the probability of voluntary liquidation increases with the percentage of a company's stock held by the CEO. Latham and Braun (2009) find that managers with more ownership in poorly performing firms appear to reduce overall firm R&D expenditures at a greater rate than their peers with less firm ownership. Measured by debt rate, Füss, Rottke, and Zietz (2011) find for real estate investment trusts that equity-incentivized managers are less likely to increase risks.[3] Kim and Lu (2011) demonstrate a negative relation between Tobin's Q and CEO ownership. Taken together, these papers suggest that managers who hold firm equity have less opportunity to diversify risk. As a consequence, these managers are less likely to engage in riskier projects than well-diversified outside shareholders. We therefore make the following prediction:

Hypothesis 1: There is a negative association between the risk exposure of a bank and the extent to which its management holds bank equity.

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[3] Eisenmann (2002) documents that owner-managers take on riskier projects than managers with low equity incentives. This finding is consistent with Laeven and Levine (2009), who also find that large outside shareholders are inclined to take on more risk.

Considered from one dimension it would be reasonable to assume that increased regulation prompts banks to reduce risk. Laeven and Levine (2009) find a main effect that is consistent with this reasoning. However, it is not necessarily the case that stricter regulation leads banks to decrease risk-taking. Grossman (1992) argues the opposite in describing the introduction of deposit insurance in the 1930s. To qualify for participation in the program, banks reduced their risk. But once insured, these bank managers did not hesitate to take more risk. Thus the argument is that the insurance promotes risk-taking. Put differently: so long as the bank does what other banks are doing, the probability of a rescue is extremely high (Stiglitz et al. 1993).[4] Stiglitz et al. (1993) plead for recognition of this effect associated with regulation. And the results documented by Laeven and Levine (2009) suggest that regulation may insufficiently achieve its objective. Consistent with Grossman's *insurer argument*, they find that regulation prompts banks to take on more risks when block holders own shares. Indeed the increased probability of a rescue decreases the costs of default to the shareholder so that he is motivated to push the bank to take more risk than it would have in the absence of regulation. This begs the question as to whether managers holding equity arrive at the same conclusion as external shareholders. Like outside shareholders, they would conclude that their risk-taking actions are insured, and they would likely believe that the bank would be saved in a crisis, rendering the magnitude of the risk to which they expose the bank less relevant. Secondly, bank managers may expect that bank regulators to prevent them from taking too much risk. We therefore propose the following hypothesis:

Hypothesis 2: The relation between risk exposure of a bank and the extent to which its management holds on to bank equity is positively moderated by the extent to which the bank is subject to bank regulation.

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[4] Saunders et al. (1990) argue the opposite. That is, they argue that less regulation allows for more risk taking and thus risk seeking bank managers will start take on higher levels of risk when regulation levels are reduced.

3. Data, model design, and descriptive statistics

3.1 Sample

We collect information on all publicly listed banks identified by Bankscope at the end of 2009. We consider banks worldwide. A bank enters the sample when (1) there is a match in Worldscope, (2) Bankscope contains sufficient information to calculate bank risk-taking, and (3) we can find data on managerial ownership. For many countries, we can find the necessary data for a handful of banks, typically the largest in the country. We obtain information on 307 banks across 37 countries. Laeven and Levine (2009) focus on the 10 largest banks per country and find ownership data on 279 banks from 48 countries. Our selection criteria resemble theirs with the exception that we decide to include *all* available bank observations per country. In practice, this boils down to the inclusion of a larger number of US banks. All non-US banks in our sample are among the 10 largest listed banks in their home country. It is important to note that we require the *exact* percentage or number of shares owned by managers and not merely whether the management constitutes a small (e.g. less than 5% or 10%) or a large shareholder in the bank.

3.2 Managerial ownership

We use two measures of managerial ownership. Our first comprises the percentage of stock that is owned by the bank's top management (OWNMAN). Our second equals the value of the managerial stock holdings is US dollars (OWNMAN_USD). Data permitting, we collect ownership data from the top five executives. For about half of the sample, we can only identify ownership for one or two executives (typically the CEO and, in some instances, the CFO). For each bank, we sum the percentages of stock held by top management in each year to calculate

OWNMAN. When assessing managerial ownership over several years, we average the total

percentages of ownership over the years available. To measure OWNMAN_USD, we sum the

dollar value of stock ownership held by the top management, measured as the percentage of

shares multiplied by the stock price per share in US dollars at the end of each fiscal year. We

then average these dollar amounts over the years. As OWNMAN_USD is highly skewed to the

right, we use the natural logarithm of the dollar value of ownership in thousand dollars, which is

normally distributed.

For US banks, we rely on managerial ownership data from ExecuComp. For non-US

banks, we hand-collect data on managerial ownership from annual reports. We complement the

sample with data from bank websites, 20F filings, Bankscope, and Capital IQ. We collect data

for all years between 2000 and 2010. However, we can locate ownership data from before 2004

for only a limited number of banks. Before allowing a bank to enter our sample, we require that

managerial ownership data be available for 2006 and 2007, to ensure that we capture ownership

before the financial crisis (which, arguably, started mid-2007).

3.3 Bank risk-taking

Our main measure of bank risk is each bank's z-score, which is equal to its capital assets

ratio plus the return on assets (ROA) divided by the standard deviation in ROA. Specifically, z-

score=(ROA+CAR)/σ(ROA), where ROA is net income scaled by total assets; CAR is the ratio

of equity over assets; and σ(ROA) is the standard deviation of ROA, all measured with

accounting data.[5] Intuitively, z-score measures the number of standard deviations below the

mean by which earnings have to drop to wipe out capital. Therefore z-score captures bank

stability and measures the distance to bankruptcy (Roy 1952). A higher z-score indicates that the

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[5] All results are robust to measuring ROA as profit before tax scaled by total assets.

bank has a lower probability of default and greater stability. The measure has been used in prior

finance research as a measure of bank risk-taking (e.g. Laeven and Levine 2009; Houston, Lin,

Lin, and Ma 2010; Lepetit, Nys, Rous, and Tarazi 2008; Barry, Lepetit, and Tarazi 2011).

Because the z-score is highly skewed to the right, we use its natural logarithm in each of our

analyses. We employ the notification z-score in referring to the log value of each bank's z-score

for the remainder of the study. As z-score contains variability in (yearly) asset returns in the

denominator, we can only measure a bank's z-score over a number of years. We require a bank

to have at least three years of consecutive data on equity, earnings, and total assets available in

Bankscope to enter the sample. In our main analysis, we measure z-score over eight years, from

2000 through 2007. We chose to close our measurement period in 2007 because, during the

crisis, almost all banks were subject to greater volatility than before.[6] This decreases the

usefulness of z-score as a risk measure, and thus we exclude the years 2008 and after when

calculating z-score in our main test. In additional tests, we calculate z-score over the period of

2000 through 2010, including crisis years, and find similar results, although the correlation

coefficient with the original z-score reaches only 0.60. Z-scores become more reliable measures

of bank risk when measured over longer periods, so we calculate z-score for banks for which we

have data available for *every* year between 2000 and 2007. This procedure limits our sample to

137 banks, but our main findings remain. We also separately investigate the volatility of return

on assets, $\sigma(ROA)$, which is the denominator of z-score.

We use the volatility of stock returns as an alternative for z-score. We manually match

banks from Bankscope with the Worldscope Database to gather stock prices. We calculate

volatility of stock returns (RETURN_VOL) as the standard deviation in monthly stock returns

over the period of 2000 through 2007. Similar measures for bank risk-taking have been used in

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[6] All results are robust to measuring z-score from 2000 through 2006.

prior literature (e.g. Saunders, Strock, and Travlos 1990; Laeven and Levine 2009). We require at least 36 months of consecutive return data, which leads to the removal of 17 banks from the dataset. The advantage of stock return volatility is that it relies on market data rather than accounting data. In sensitivity checks, we calculate volatility of weekly returns, and we also assess return volatility for the period including the crisis years (2000 through 2010). In both cases, the results remain unchanged.

Note that in our study we are not primarily interested in how equity holdings affect risk-taking over the short term but rather over the longer term. In this respect, our study differs from Coles et al. (2006) , Chava and Purnanandam (2010) and Cheng et al. (2013). Coles et al. (2006) study investments that they deem to be more (R&D investments) or less (PPE investments) risky, and their data supports the prediction that R&D investments (PPE investments) are positively (negatively) associated with vega. Chava and Purnanandam (2010) propose and find that, with a higher vega, CEOs hold more cash and that their firms feature more leverage. Similarly, Low (2009) demonstrates that, in response to an exogenous increase in takeover protection, managers with low managerial equity-based incentives lower firm risk. Cheng et al. (2013) demonstrate risk taking to be associated with that short-term pay (bonuses and options), also if they control for insider ownership stakes. We focus on ownership in the form of managers owning and holding on the shares of their own bank.

Where Cheng et al. (2013) measure risk as a one year lag factor lag or in the year of its origin, we are primarily interested in how risk-taking is affected over a longer period when managers have skin in the game. We study this phenomenon over a longer period so as to observe how risk-taking is affected by the dependence of CEO wealth on equity value. While contemporaneous effects of vega and delta may be observable, managers over time may put

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different weights on what they stand to win or lose with increased risk-taking. The exogenous shock brought about by the financial crisis allows us to examine whether equity holdings drive risk-taking over time. The shock lets us compare banks' risk-taking and stock returns. The premise would be that higher risk-takers show lower shareholder returns in the crisis. We argue in the next section that this lower risk-taking should bear out in bank performance during the crisis. That, is, banks that took less risk before the crisis are bound yield higher returns during the crisis. That is the next stage in our analysis.

3.4 Stock returns during the financial crisis

An important aspect of our study is that we evaluate how each bank performed during the recent financial crisis by calculating each bank's stock performance during that period. Similar to Beltratti and Stulz (2012) and Erkens, Hung, and Matos (2012), we interpret worse stock returns during the crisis as evidence of greater risk-taking beforehand. One advantage of this test is that risk is measured *after* managerial ownership is measured, which makes the potential for reverse causality and endogeneity less of a concern. The disadvantage is that stock returns during the crisis may not merely reflect risk-taking before the crisis but also issues like the probability of receiving a government bailout or another form of government support.

We calculate stock performance during the crisis (RETURN_CRISIS) by compounding monthly stock returns between April 1, 2007, and December 31, 2008. As an alternative, we calculate the percentage change in price per share between these two dates. Results are very similar. Our return window starts before the summer of 2007 because this is generally considered to be the moment when investors started to realize the seriousness of losses related mostly to subprime mortgages (Ryan 2008). We close our return period at the end of 2008, which is right

after the peak of the crisis (Ivashina and Scharfstein 2010). October 2008 is considered the peak of the bank crisis, after Lehman Brothers' collapse. Indeed, we find that much of the banks' negative stock returns occur in September and October of 2008. Our results, however, are robust when we end our window in September instead of December.

3.5 Bank regulation and control variables

We follow Laeven and Levine (2009) and Barth, Caprio, and Levine (2006) in measuring bank regulation, focusing on deposit insurance, capital regulations, and regulatory restrictions on banking activities. DI is a dummy variable that is equal to one if the country has deposit insurance. Next, we test two measures of capital regulations. CAPREQ is equal to the minimum capital requirement in the country. For most countries, this number is 8 percent, but for others it is up to 12 percent. CAPSTR stands for the extent of capital stringency and is an index of regulatory oversight of bank capital. CAPRESTR is an index of regulatory restrictions on bank activities.

We introduce several other bank-level and country-level control variables. Most importantly, we control for a bank's ownership structure by including the percentage of shares held by the largest owner in the bank (LARGESTOWNER). Laeven and Levine (2009) conclude that bank risk-taking increases with relative power of shareholders. When the largest shareholder holds less than 5 percent of the stock, we consider the bank as widely held (and the value of LARGESTOWNER is zero for these observations). We collect ownership data from annual reports, Bankscope, and Capital IQ. We average the total percentages of ownership over the years available. We further investigate the role of ownership structure for explaining risk-taking behavior by considering whether there are external (large) shareholders represented in the board

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or not (EXTERNAL_OWNER_IN_BOARD) and whether there is any state shareholder in the

bank or not (STATE_OWNER).[7]

At the bank level, we further control for bank size (BANKSIZE), measured as the natural

logarithm of total assets at the end of each year in thousands of US dollars. Replacing assets with

year-end market value measure does not change the results. We add a dummy variable that takes

the value of 1 if the bank is one of the three largest banks in the country (TOOBIGTOFAIL).

Larger banks may have incentives to take more risk, as the likelihood of getting bailed out by the

government increases with size. We also add the bank's average annual increase in net interest

income (BANKGROWTH) as a growth measure. Measuring growth in total assets does not

change the results. Many banks engaged in large and often risky takeovers in the period before

the crisis to increase in their size and market share. Bank growth is expected to be negatively

associated with stability and may also be considered as a measure of risk-taking. We also add

loan loss provisions scaled by net interest income (LLP). Finally, we control for performance

sensitivity of managers' remuneration. Since we only have detailed remuneration data (data on

options, long-term incentive plans, pension plans, etc.) available for a few banks, we cannot

control for performance-pay sensitivity and vega. However, for 238 banks, we can distinguish

between the amount of fixed pay (unrelated in any way to bank performance) and the amount of

variable pay (all types classified together) through hand-collecting data from annual reports. We

average the amount of fixed pay on total pay across all available top managers and average

across years between 2000 and 2007 (FIXEDPAY).[8] At the country-level, we control for

prosperity by adding a country's gross domestic product per capita (GDPCAPITA).

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[7] Table 6 provides detailed information on measurement of EXTERNAL_OWNER_IN_BOARD and
STATE_OWN.

[8] In some cases, we observe fixed and variable pay for only the CEO. In our bank-year analysis, FIXEDPAY is
calculated on an annual basis.

3.6 Model design

In our main specification, we examine how managerial ownership explains variation in bank risk-taking. The primary measure of managerial ownership (OWNMAN) is the sum of the top five executives' share ownership in their bank, measured at the end of 2000 until 2007 and averaged over those years. We require the availability of at least one executive's ownership for at least the years 2006 and 2007.[9] In further analyses, we also test for the dollar value of managerial equity holdings as an alternative ownership metric. A bank's z-score, its equity volatility, and its stock performance during the financial crisis are the main dependent variables capturing a bank's risk-taking (RISK). Formally, we estimate the following regression equation:

$$RISK_{b,c} = \alpha_1 * OWNMAN_{b,c} + \alpha_2 * X_{b,c} + \alpha_3 * Y_c + \varepsilon_{b,c},$$

where $RISK_{b,c}$ is either log of z-score, RETURN_VOL, or RETURN_CRISIS of bank b in country c; $OWNMAN_{b,c}$ is total managerial ownership; $X_{b,c}$ is a matrix of bank level control variables; Y_c is a matrix of country-level control variables and regulation variables; $\varepsilon_{b,c}$ is the error term; and α_1, α_2 and α_3 are vectors of coefficient estimates. We test for the effect of managerial ownership on risk-taking, measuring ownership in percentages and in dollar amounts. To test for potential nonlinear relationships between managerial ownership and bank risk-taking, we include a dummy variable equal to one if managerial ownership exceeds 5 percent (DUMMY_OWNMAN). Note that managerial ownership exceeds the 5 percent threshold only for a minority of the sample.[10] In this case, senior management can be expected to act more like a

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[9] For most banks, we have managerial ownership data available from 2005 onwards.
[10] For 37 banks (or 12 percent of the sample), we find that aggregate managerial ownership exceeds 5 percent. For 27 banks, managerial ownership is larger than 10 percent, and for four banks managers hold more than 50 percent of

large owner. We opt for a 5 percent threshold because this is the most widely used classification

to distinguish between minority shareholders and block holders. The interaction between

OWNMAN and DUMMY_OWNMAN captures how the relation between risk-taking and

managerial ownership differs for banks in which managers hold large equity stakes versus those

for which managers hold small stakes. We use ordinary least squares (OLS) with clustering at the

country level. We winsorize the top and bottom 1 percent of RETURN_VOL, BANKGROWTH,

and LLP. In Section 4.5, we employ an alternative specification using bank-year observations

instead of aggregations across years.

3.7 Summary statistics

Table 1 Panel A shows descriptive statistics on all relevant bank variables. Table A1 (see

appendix) shows averages per country. We find a lot of variation in bank stability across banks

and across countries.[11] Managerial ownership and ownership structure also vary considerably

across banks. Percentage-wise, managerial ownership is low. Mean managerial ownership totals

to 3.37 percent, and for the median bank, this is only 0.29 percent. For 50 banks, managers do

not hold any stock at all.[12] For five banks, managers have more than 50 percent of the shares.

Dollar values of managerial equity holdings also vary greatly across banks and are heavily

skewed to the right. The average dollar value of managerial bank ownership is over 100 million

USD, while the median is only 9.7 million USD and the 75th percentile 48.6 million USD. For

the average bank, the largest (outside or inside) shareholder holds 15 percent of the stock. About

the shares. For 19 banks, we find that the CEO holds more than 5 percent. All results hold when using the 10 percent threshold instead of 5 percent.

[11] Our sample largely consists of commercial banks. However, 16 banks have investment banking rather than commercial banking as their main activity (5 percent of the total sample). Univariate results show that, as can be expected, these banks show evidence of greater risk taking. All of our findings go through when excluding them from the sample. There are too few observations to meaningfully investigate differences between commercial and investment banks.

[12] Excluding these does not alter our results in any significant way.

one fourth of the banks are widely held. In addition we observe that on average 51.1 percent of the bank managers' remuneration is fixed.

Table 1 Panel B shows the distribution of year-to-year changes in managerial ownership. We calculate changes as the difference between ownership at the end of the year divided by the prior year's ownership. For all 1,642 observed changes over the period of 2000 through 2010, almost 90 percent were smaller than 1 percent. Also, the changes do not increase after 2007. These results highlight that managerial ownership typically changes slowly over time. It therefore also seems unlikely that within-bank variation in managerial ownership over time would lead to significant changes in managerial risk-taking. The results also indicate that managerial equity incentives do not change notably over time.[13] However, we find that cross-sectional differences in managerial ownership are large. Table 1 Panel C compares average ownership across managers. The sample of banks is divided into deciles according to average managerial ownership over the period of 2000 through 2007. We find large differences across deciles. From the results presented in the last two panels, we arrive at the following conclusions. First, if stock ownership is relevant to managerial incentives, its impact would appear in cross-sectional tests. Second, year-to-year changes in managerial ownership do not indicate any substantial changes in incentives given to managers.

The correlation matrix in Table 2 provides us with the first insights on the magnitude and nature of the relation between managerial ownership and bank risk-taking. Correlations show that more stable banks (as measured by higher z-score) show no significant relation with

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[13] Note that we have not included executive stock options (ESOs) in our sample. However, we consider this not to constitute a concern for our research design. That is, it is demonstrated in previous literature that the number of ESOs are positively associated with higher risk taking and vice versa (e.g. Armstrong and Vashishtha, 2012). Our enquiry is directed towards an examination of whether more equity is associated with LESS risk taking. The presence of ESOs in a bank should therefore work against us finding a result. ESOs are not included because this data is almost absent for the non US sample.

percentages of managerial ownership but a significantly positive correlation with dollar amounts of managerial ownership. Moreover, Spearman rank correlations between z-score and managerial ownership (both percentages and dollar values) are significantly positive. Returns in the crisis correlate significantly with managerial ownership. Also noteworthy is that the rank correlation between managerial ownership in percentages and managerial ownership in dollar values is much stronger (0.81) than the Pearson correlation (0.36). The vast differences between regular and rank correlations hint at nonlinear relations between bank risk and managerial ownership. Consistent with findings of Laeven and Levine (2009), we find that more stable banks (as captured by higher z-score, lower equity, and earnings volatilities) feature less concentrated ownership structures (i.e., lower LARGESTOWNER).

Before formally testing the relation between bank risk-taking and managerial ownership, we first investigate whether managers take more risk when they have more incentives to do so. One way of measuring this is to consider whether the bank's initial stock price is low. If a bank's stock price is low, managers have more incentives to engage in risky projects, other things equal. In this case, the stock acts as a virtual call option. Conversely, when stock price is higher, managers have incentives to prevent it from dropping and are motivated to take less risk, especially when they have larger equity holdings in the bank. Results in Table 3 show that banks in the lowest quartile of stock price per share in USD measured at the end of 2000 take more risk in the future, as indicated by lower z-scores and higher return and earnings volatilities. Returns in the crisis are not significantly lower, but this result is partially by construction. This analysis also helps validating our measures of bank risk taking.

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4. Managerial ownership and bank risk

The main conclusion from the regression analyses presented in Table 4 and Table 5 is that larger equity ownership by bank managers is associated with less risk. Table 4 presents the results for z-score and Table 5 for stock return volatility.

4.1 Managerial ownership and z-score

We first test for the effect of *percentage* of managerial ownership on bank risk-taking. Results in Table 4, specification 1, show no apparent linear relationship between percentage of managerial stock holdings and z-score. As Spearman (rank) correlations between risk and ownership suggest a nonlinear relation, we distinguish large from small shareholdings, following among others Eisenmann (2002) and Laeven and Levine (2009). Specifically, we distinguish banks in which the management holds 5 percent or more of equity from banks in which managers possess less than 5 percent. For the latter group, which comprises 88 percent of the sample, we find a positive relation between managerial ownership on z-score (specification 2).[14] The interaction coefficient between the greater-than-five-percent ownership dummy (DUMMY_OWNMAN) and managerial ownership is negative, indicating that the *incremental* effect of managerial ownership on z-score for banks with large managerial stock holdings is negative. The *overall* effect of managerial ownership on z-score for banks in which managers have more than 5 percent of equity is zero (represented by the sum of 18.41 and -18.33). In specification 3, we exclude observations with 5 percent or more of managerial ownership and find a similar coefficient in magnitude and significance as in specification 2. Economic

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[14] When putting the cut-off at 10 percent instead of 5 percent, we find that z-score increases with managerial ownership for banks with less than 10 percent managerial ownership. Although less than a tenth of the sample, banks with more than 10 percent of managerial ownership prevent us from finding a linear relation between percentage of managerial ownership and risk-taking for the entire sample.

magnitude of OWNMAN appears to be significant: a 1 percent change in OWNMAN is associated with a change in z-score of 0.19 (=0.01*18.6944).

Next, we examine the relation between bank risk and *dollar values* of managerial ownership. We measure OWNMAN by taking the natural logarithm of the value of managers' equity holdings in thousands of US dollars, computed by multiplying the share price at the end of each year by the amount of shares owned by top management and averaged over the period of 2000 through 2007. Results in specification 4 indicate that higher managerial ownership is associated with a higher z-score, suggesting less risk. In this case, we do find a significant linear relationship between managerial ownership and risk-taking *without* segmenting the sample; or, in other words, including banks with 5 percent or more of managerial ownership.

In specification 5, we control for the bank's ownership structure. Consistent with Laeven and Levine (2009), we find that higher shareholder concentrations are associated with lower z-scores. In specification 6, we add additional bank controls and GDP per capita, which does not materially change results. Growing banks and banks with more loan loss provisions have lower z-scores. For completeness, we show results including additional controls when excluding banks with 5 percent or more of OWNMAN (specification 7) and when using OWNMAN in dollar terms instead of percentages (specification 8).[15] A deeper analysis of the reasons for a linear relationship for dollar values but a nonlinear one for percentages reveals that banks with larger managerial ownership are, in general, smaller.[16] In these banks, percentage ownership might be high, while dollar amounts remain relatively low. Or conversely, even when management holds

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[15] In this case we orthogonolize GDP per capita on managerial ownership in dollar values. These two variables are highly correlated.

[16] Log of total assets is on average 16.59 for banks with managerial ownership of less than 5 percent, which is significantly higher than the average of 15.08 for banks with 5 or more percent managerial ownership (p-value = 0.000).

only 1 or 2 percent of a large bank's shares, the dollar amount can be very high, likely providing incentives to decrease risk-taking if managers fail to diversify their risk exposure.[17]

To ensure that our findings primarily reflect cross-bank differences instead of cross-country differences, we introduce country fixed effects in specification 9. The positive relation between managerial ownership and z-score holds for banks with less than 5 percent managerial ownership, even when including country fixed effects which remove all variation in bank risk across countries.

We test a number of alternative risk measures. The requirement to have three consecutive years of accounting data available to measure z-score may induce a bias as for some banks the z-score is calculated over three years of data, while for others it is calculated over eight years. In specification 10, we calculate z-score only for banks that have a string of eight years of accounting data over the period of 2000 through 2007 (full data). This procedure reduces our sample size. In specification 11, we calculate z-score over the period of 2000 through 2010. In specification 12, we examine earnings volatility, $\sigma(ROA)$, as the standard deviation of earnings for which we predict opposite relations compared to z-score. Our findings prove to be robust for each of these three alternative risk measures. In specification 13, we introduce FIXEDPAY, which is the ratio of fixed on total pay of each bank's management. The variable does not influence risk taking and our main inferences hold.

Overall, results in Table 4 support hypothesis 1: larger managerial stock holdings in banks are associated with higher bank stability and therefore indicate less risk-taking. We also

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[17] For example, managers of United Overseas Bank from Singapore own less than 1 percent of the shares but are exposed for over 100 million USD, while management of Finansa Public Co., a small Thai bank, holds over 10 percent of the shares and is exposed for less than 10 million USD. Other examples are SunTrust Bank and Bank of Hawaii, both mid-sized US banks. Management holds less than 1 percent of the stock in each but is exposed for well over 50 million USD, respectively. Managers of Hong Kong's East Asia Bank hold on to less than 2 percent of equity, which represents close to 150 million USD.

find that this relation disappears for banks with high managerial shareholdings, preventing us from finding a linear effect of managerial ownership measured in percentages for the entire sample. We test an alternative model to investigate the nonlinearity in the relation between managerial ownership and z-score by including cubic managerial ownership terms. Consistent with results in Table 4, we find a positive coefficient on OWNMAN and a negative coefficient on OWNMAN^2. These findings are consistent with the idea that larger managerial stock holdings mitigate tensions between owners and managers, supporting theoretical arguments and empirical results from Houston and James (1995), Eisenmann (2002), and Laeven and Levine (2009).

4.2 Managerial ownership and stock return volatility

In Table 5, we test the relation between managerial ownership and stock return volatility. Return volatility equals the standard deviation of bank's monthly stock returns from 2000 through 2007, with higher volatility indicating more risk-taking. Overall, results comport with our hypothesis. Again, we fail to find a linear relation between risk and managerial ownership for the full sample. When removing banks with 5 percent or more managerial ownership (less than 12 percent of the sample), we find a strong negative relation between managerial ownership and return volatility (specification 2). For banks with managerial ownership above 5 percent, we find the overall effect of managerial ownership to be zero. When excluding these banks, we find a negative coefficient of the same magnitude (specification 3). Importantly, when we capture OWNMAN by means of dollar values rather than percentages, we find a significantly negative (and linear) association with return volatility for the entire sample of banks (specification 4). These results hold when controlling for the bank's ownership structure (specification 5) and introducing control variables (specifications 6-8).

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The effects seem economically relevant. Using specification 3, a one standard deviation increase in OWNMAN, moving from the first to the third quartile of OWNMAN (from 0.01 percent to 1.73 percent), is associated with a decrease in return volatility of 0.01, with RETURN_VOL having a mean of 0.089 and a standard deviation of 0.049 in the sample. When putting all controls at the mean in specification 7, moving from the first to the third quartile of OWNMAN entails a decrease in return volatility of 16 percent (from 0.095 to 0.08).

Result holds when introducing country fixed effects (specification 9) and when assessing return volatility over the period 2000-2010 (specification 10). In the latter specification, the effect of ownership structure disappears, but the effect of managerial ownership remains significant. Finally, the results hold when controlling for pay for performance (specification 11). The negative coefficient on FIXEDPAY indicates that, when managers' remuneration varies more with performance (i.e., less fixed pay on total pay), return volatility increases. Despite our inability to fully capture how managerial wealth varies with bank performance for each bank, this result suggests that we, at least partially, control for pay sensitivity. In sum, results from Table 4 and Table 5 depict a robust association between managerial ownership and risk-taking.

4.3 Bank ownership characteristics: external owner in the board and state ownership

In the next set of analyses, we further examine whether the bank's ownership structure affects its incentives to take on risk. First, we study the mechanism of how external shareholders may entice bank managers to engage in higher risk taking as suggested by Levine (2004) and Bolton et al. (2011). Consistent with this literature our conjecture is that those shareholder who are represented by a director (EXTERNAL_OWNER-IN_BOARD), are in a better position to influence executive board members. To examine this idea we collect data on which shareholders

are represented on the board of directors of the banks. We consider shareholders who own more than 5 percent of the bank shares. Many banks have individual shareholders with stakes above 5 percent. However, it is not necessarily the case that each of these shareholders is seating or represented in the board.[18] We are able to collect the necessary board information for 264 banks. For 36 percent of these, we find that there is at least one majority shareholder represented in the board during 2005-2007.

In Table 6 we reproduce the results of our analyses. In panel A we show that for those cases that shareholders have claimed a seat on the board they are more likely to see over executives that manage higher risk levels. We observe that the results hold for specifications where we use a dummy to measure the presence of a director representing a (large) shareholder (specification 1 and 2) , or when we take the percentage of shares the shareholders represents (specification 3 and 4). We also examine whether our results hold for our alternative measure of risk; return volatility. Again, whether we define external directors representing shareholders as a dummy or as a percentage of total shares, the results come through. Taken together our results suggest that these nonexecutive board members do entice their managers to expose the bank to higher levels of risk. In addition, our results for managerial ownership hold when we include board member data. We also ran an analysis (not tabulated) where we include a dummy for any director representing a large shareholder and a dummy for large shareholders. This analysis again confirms our results, that is, banks that have nonexecutive directors representing shareholders take higher risk levels.

In a next set of analyses, we investigate to what extent state ownership has an impact on bank risk taking. State-owned banks or banks in which the government is a large shareholder are expected to take on more risk because of at least two reasons. First, the government may function

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[18] Warren Buffett is a large shareholder in American Express, but does not sit on the company's board.

as an insurance firm in case the bank runs into trouble, providing managers with greater

incentives to take on risk. Second, the government may tempt or force bank managers to engage

in risky projects which are expected to benefit society (and politicians) and which other banks do

not want to take on. For our sample, we find that the state has a 5 percent or higher ownership

stake in 23 banks, mainly from emerging economies such as India and Pakistan. Again we run

our regressions with dummies for state ownership (specifications 1, 2, 5 and 6) and percentage of

shares (3, 4, 7 and 8). Results in Panel B of Table 6 confirm our prediction: we find that in

banks with state ownership z-score is lower and return volatility higher. Our findings on how

managerial ownership affects risk taking do not change in any material way when including state

ownership.

4.4 Stock returns during the financial crisis

        The recent financial crisis provides us with a unique opportunity to validate our findings

and address endogeneity potentially affecting our results. We examine stock returns during the

crisis as an indicator of the amount of risk banks took before and during the crisis. Specifically,

we compound monthly stock returns measured over 21 months between the second quarter of

2007 and the end of 2008. Larger negative return for a bank during this period are indicative of

excessive risk-taking before the period (Beltratti and Stulz 2012; Erkens, Hung, and Matos

2012). Although most banks register negative returns during the period, our data show

substantial heterogeneity across banks in terms of the magnitude of the stock price decline.[19]

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[19] For example, Allied Irish Banks, Royal Bank of Scotland, and Dexia saw drops in their stock price of 92 percent, 91 percent, and 86 percent, respectively, while Spain's BBVA and Australia's Wide Bay Bank dropped by 37 percent and 41 percent, respectively. A few banks did not even realize a drop in the stock price between the first quarter of 2007 and the end of 2008, such as Canada's Laurentian Bank, Hong Kong's China Everbright, and Indonesia's Bhakti Investama Bank.

Results in Table 7 are indicative of a nonlinear relation between percentage of managerial ownership and stock performance during the crisis. When distinguishing between small vs. large managerial shareholdings (specification 2), we find that managerial ownership is positively associated with stock returns during the crisis for banks with less than 5 percent managerial ownership (covering almost 90 percent of observations). In other words, banks with higher managerial ownership experienced *less* negative returns during the crisis, suggesting less risk taking. The interaction term between DUMMY_OWNMAN and OWNMAN indicates that, for banks in which management is also a large shareholder, the relation between ownership and crisis stock returns is *incrementally* negative. The *overall* effect on stock returns is zero.

Adding ownership structure (specification 3), bank control variables and per capita income (specification 4) does not change the results. In specification 5, we exclude observations with 5 percent or more OWNMAN as an alternative model. In specification 6, when using dollar amounts instead of percentages, we find an insignificant coefficient on OWNMAN. However, when testing the same relation with dollar values for banks with less than 5 percent managerial ownership (specification 7), the coefficient becomes significant again. As an alternative dependent variable, we measure the percentage change in stock price between April 1, 2007, and December 31, 2008. Results remain the same (specification 8). In general, we find that in banks with more managerial ownership, stock returns during the crisis were less negative.

4.5 Bank risk-taking, ownership, and regulation

In hypothesis 2, we predict managerial ownership to affect bank risk-taking as regulation increases. Our arguments are consistent with the idea put forward by Laeven and Levine (2009), who demonstrate that larger external ownership diminishes the risk-reducing effects of capital

stringency, restrictions on banks engaging in non-lending activities (such as securities and insurance underwriting), and deposit insurance. In Table 8 we reproduce the results of our analyses for the z-score (specifications 1-4) and stock return volatility (specification 5).

We first run a model invoking regulation only (specification 1). Contradictory to Laeven and Levine (2009) we find little evidence to indicate that regulation directly affects bank risk taking. In specification 1 we find none of the regulation variables to affect risk taking significantly. Recall, however, that our z-score estimates are based on data that runs from 2000 through 2007, while Laeven and Levine base their z-score on the period 1996-2001. Regulation may have started to affect bank decisions differently during the years of 2000 through 2007 compared with their earlier period. In fact, based on their empirical work , Barth, Caprio, and Levine (2006, pp. 213-224) doubt whether regulation can have a stabilizing effect on banking activities. This concern is to some extent borne out in our results. That is, we observe that the potential restraining effect of regulation on risk-taking diminishes when large owners are present. Laeven and Levine (2009) demonstrate capital requirements (capital stringency and deposit insurance) to be associated with lower (higher) risk levels. When we allow regulation to interact with ownership (specification 2) we do find that more regulated banks with higher managerial ownership take higher risks. This is true for the factors of deposit insurance and capital requirement. When we replace the *managerial* ownership factor with the *largest* ownership factor (specification 3) we observe that more regulated banks with higher ownership concentration take higher risks when capital requirements and capital stringency are considered. The result on the interaction between deposit insurance and largest owner appears to contradict the expectation. However, when we run our full model (specification 4) we find some evidence that is consistent with the expectations in that the main effect of capital requirements indeed has

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a positive association with risk taking while both manager-owners as well as outside shareholders seem to be invited to allow the bank to take on higher levels of risk when capital requirements are stepped up. Our return volatility analysis is consistent with these findings.

In conclusion, the result provides some weak evidence for the finding that managerial owners feel better protected against wealth reduction when their bank is subject to more stringent capital requirements. Consistent with Laeven and Levine (2009), however, we find evidence for this relation for outside shareholders. From these results, we conclude that our evidence provides some support for hypothesis 2. That is, bank managers who own a larger part of their bank are more willing to take risk when bank regulation becomes stricter. What is more important, though, is that, as far as manager owners are concerned, regulation affects their risk-taking only to a limited extent. While risk-taking for external shareholders starts to play an important role only when regulation is likely to protect the bank against default, owner-managers will be inclined to expose their bank less risk almost regardless of the level of default protection. In conclusion, our results consistently point to a risk-reducing effect of managerial ownership.

4.6 Analyses at the bank-year level

As the calculation of z-score requires a series of earnings over time provide us with only one observation per bank, we have performed our analyses at the bank-level so far. An alternative approach is to conduct a bank-year analysis. We use return volatility, measured as the yearly standard deviation of monthly stock returns. First, we test return volatility in the period 2000-2007. Year effects (not reported), bank controls, and per capita income are added to the model as controls. Standard errors are clustered at the country level.[20]

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[20] Clustering standard errors at the bank level does not alter our results.

Table 9 shows results. We find a negative relation between managerial ownership and return volatility for banks with managerial ownership of less than 5 percent (specification 1). Note that this analysis encompasses nine out of ten bank-year observations. For the other observations (the top decile of managerial ownership), we find no association with return volatility (-0.82+0.87 is not different from zero). In specification 2, LARGESTOWNER enters positively in the regression indicating that risk-taking varies positively with comparative power of shareholders. Adding bank control variables and GDP per capita (specification 3), and the ratio of fixed on total pay (specification 6) does not alter the main result. As before, we note that managerial ownership in percentages is highly skewed (to the right), providing observations with high OWNMAN values with a high weight in the regression. When investigating dollar values of managerial ownership and their relation with return volatility (specification 6), we find a significantly negative relation between bank risk and managerial ownership.

In specifications 7-9, we test how managerial ownership, measured *before* the financial crisis, relates to return volatility *during and after* the crisis. Interestingly, we find that banks with more managerial ownership experience lower future return volatility. For completeness we show robust results when excluding banks with OWNMAN of 5 percent or higher (specification 8) and when testing dollar values of managerial ownership (specification 9).

5. Conclusion

We conduct an empirical analysis to gauge how managerial ownership relates to risk-taking by banks. We show that, while large shareholders may motivate bank managers to take more risk, higher managerial equity incentives have the opposite effect. Our evidence suggests that shareholders attract a director that represents their interest of higher risk taking on the board.

Based on theory, we argue that managers holding equity may prefer to take less risk because they are more likely to be exposed to systematic risks that they cannot diversify away. Our results are consistent with this idea. We find that bank managers with larger equity holdings take fewer risks than outside shareholders. Our evidence also suggests that (large) external shareholders affect risk taking via directors representing their interests on the board.

We find some evidence to suggest that bank manager shareholders are tempted to increase the bank risk exposure when regulation protects the bank against default. This is a salient finding in that previous work demonstrates, as we also do, that outside owners tend to expose their bank to more risk when a bank is subject to more regulation. Owner-managers, however, have marginally a lesser tendency than outside shareholder to increase their bank's risk when increased regulation protects the bank against default. Controlling for regulation, owner-managers also are less likely to expose their bank to risk than their colleagues holding no or fewer bank shares.

We also find that banks with larger managerial equity holdings perform better during the financial crisis than banks that have equity incentivized their bank managers to a lesser extent. To our knowledge, we are the first to explicitly test for the role of managerial equity incentives in bank risk-taking. Excessive bank risk-taking can hurt economic growth and increase financial fragility, and our findings therefore also may matter to policymakers and bank board members. Based on our results, we propose that equity incentives may be used as a risk-reduction instrument, provided that bank managers cannot diversify their risks.

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Table 1: Summary statistics

The sample consists of 307 listed banks in 37 countries. Unless indicated otherwise, variables are averaged or measured over the period of 2000 through 2007, with the requirement of at least three years of consecutive data for earnings, total assets, and equity available in Bankscope. Z-score is measured as return on assets (ROA) plus the capital-asset ratio divided by the standard deviation of ROA. Z-score *full data* refers to the z-score measured for banks for which earnings, assets, and equity data are available for every year from 2000 through 2007. Z-score *2000-2010* is the z-score measured for the period of 2000 through 2010. σ(ROA) is the standard deviation of ROA. RETURN_VOL is stock return volatility measured as the standard deviation of the bank's monthly stock returns from 2000 through 2007. RETURN_CRISIS is stock returns during the financial crisis measured as the compounded monthly returns measured over 21 months between April 1, 2007, and December 31, 2008. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. OWNMAN_USD is managerial ownership expressed in millions of US dollars and measured as the logarithm of (share price at the end of each fiscal year multiplied by the amount of shares owned by the managers, expressed in thousand US dollars). LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder. BANKSIZE is the log of total assets in million USD. TOOBIGTOFAIL is a dummy equal to 1 for banks that are one of the three biggest in their country. BANKGROWTH is the annual increase in net interest income. LLP is the amount of loan loss provisions scaled by net interest income. FIXEDPAY is the ratio of fixed pay on total pay averaged over all managers with data available. Fixed pay only includes the managers' fixed salary; all other forms of remuneration such as annual bonuses and long-term incentive compensation are considered to be variable pay.

Panel A: Bank-specific variables

Variable	No of Banks	Mean	Std. Dev.	Min	Max	Q1	median	Q3
z-score (raw)	307	51.11	53.80	1.02	444.78	17.07	36.95	65.46
Log z-score	307	3.48	1.03	0.02	6.10	2.84	3.61	4.18
Log z-score *full data*	137	3.39	1.04	0.02	5.36	2.80	3.61	4.07
Log z-score *2000-2010*	307	2.90	0.92	0.11	5.49	2.30	2.95	3.48
σ(ROA)	307	0.009	0.025	0.000	0.335	0.002	0.003	0.006
RETURN_VOL	303	0.087	0.037	0.020	0.249	0.063	0.076	0.100
RETURN_CRISIS	298	0.587	0.309	0.032	1.613	0.350	0.542	0.769
OWNMAN (%)	307	0.0337	0.0961	0.0000	0.7952	0.0001	0.0029	0.0173
OWNMAN_USD (mln. $)	286	113.3	437.9	0.0	4501.9	0.2	9.7	48.6
OWNMAN_USD (log)	286	7.759	4.278	0.000	15.320	5.432	9.168	10.780
LARGESTOWNER (%)	302	0.1510	0.1931	0.0000	0.9700	0.0000	0.0862	0.1962
BANKSIZE (Log Assets)	304	16.40	2.17	10.72	21.44	14.88	16.15	17.89
TOOBIGTOFAIL	307	0.11	0.31	0.00	1.00	0.00	0.00	0.00
BANKGROWTH	306	0.1519	0.7464	-5.2646	10.4413	0.0462	0.1023	0.1877
LLP	260	0.178	0.443	-0.565	4.779	0.031	0.102	0.202
FIXEDPAY	238	0.511	0.281	0.000	1.000	0.303	0.518	0.719

Table 1: Summary statistics (Cont.)

Panel B: Within-Bank Changes in Managerial Ownership

This panel presents summarized information on the distribution of within-bank, year-to-year changes in managerial ownership. The sample consists of 307 listed banks in 37 countries. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. Changes in OWNMAN are the difference in year-end ownership divided by the previous year's ownership. In the table, |%change| denotes absolute percentage changes. The numbers in the second column are the corresponding percentage of the observations. The table reports separate distributions for changes in managerial ownership that occurred during the period of 2000 through 2007 (with the last changes occurring between 2006 and 2007) and changes in managerial ownership that occurred during the period of 2008 through 2010 (with the first change occurring between 2007 and 2008).

Range of yearly percentage **change** in OWNMAN	Total sample (All changes)		2000-2007 (last change: 2006 - 2007)		2008-2010 (first change: 2007-2008)	
|%change|<1%	1,464	89.1%	705	87.6%	758	90.6%
1%<|%change|<5%	141	8.6%	82	10.2%	59	7.0%
5%<|%change|<10%	16	1.0%	11	1.4%	5	0.6%
10%<|%change|<20%	8	0.5%	4	0.5%	4	0.5%
20%<|%change|<30%	9	0.5%	3	0.4%	6	0.7%
30%<|%change|<40%	2	0.1%	0	0.0%	2	0.2%
40%<|%change|<50%	0	0.0%	0	0.0%	0	0.0%
50%<|%change|	3	0.2%	0	0.0%	3	0.4%
total yearly change observations	1,642	100.0%	805	100.0%	837	100.0%

Panel C: Cross-Sectional Variation in Managerial Ownership

This panel compares average ownership across managers. The sample consists of 307 listed banks in 37 countries. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. The sample is divided into deciles based on each management's average stock ownership over the period of 2000 through 2007, where the first decile includes those banks for which managers have the lowest stock holdings.

deciles of average managerial ownership (2000-2007)	decile median	decile median over sample median
1	0.0000	0.0000
2	0.0000	0.0000
3	0.0001	0.0402
4	0.0004	0.1395
5	0.0020	0.6816
6	0.0041	1.4330
7	0.0090	3.1163
8	0.0180	6.2330
9	0.0426	14.7397
10	0.2224	76.9685

Table 2: Correlations

This table contains correlation coefficients and significance levels (two-sided p-values) on the dependent, explanatory, and control variables used in the study. The upper triangle contains Pearson correlations. The bottom triangle contains Spearman rank correlations. Correlations are the bank level. The sample consists of 307 listed banks in 37 countries. Variables are averaged or measured over the period of 2000 through 2007, with the requirement of at least three years of consecutive data for earnings, total assets, and equity. Z-score is measured as ROA plus the capital-asset ratio divided by the standard deviation of ROA. Z-score *full data* refers to the z-score measured for banks for which earnings, assets, and equity data are available for every year between 2000 and 2007. Z-score *2000-2010* is the z-score measured for the period of 2000 through 2010. $\sigma(ROA)$ is the standard deviation of ROA. RETURN_VOL is stock return volatility measured as the standard deviation of the bank's monthly stock returns from 2000 through 2007 and winsorized at the top and bottom percentile. RETURN_CRISIS is stock returns during the financial crisis measured as the compounded monthly returns measured over 21 months between April 1, 2007, and December 31, 2008. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. OWNMAN_USD is managerial ownership expressed in (million) US dollars and measured as the logarithm of (share price at the end of each fiscal year multiplied by the amount of shares owned by the managers, expressed in thousand USD). LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder. BANKSIZE is the log of total assets in million USD. TOOBIGTOFAIL is a dummy equal to 1 for banks that are one of the three biggest in their country. BANKGROWTH is the annual increase in net interest income. LLP is the amount of loan loss provisions scaled by net interest income. FIXEDPAY is the ratio of fixed pay on total pay averaged over all managers with data available. Fixed pay includes only the managers' fixed salary; all other forms of remuneration, such as annual bonuses and long-term incentive compensation, are considered to be variable pay.

	z-score	σ(ROA)	RETURN_VOL	RETURN_CRISIS	OWNMAN	OWNMAN_USD	LARGEST OWNER	BANK SIZE	TOOBIG TOFAIL	BANK GROWTH	LLP	FIXED PAY
z-score		-0.488	-0.541	0.151	-0.068	0.182	-0.227	0.113	0.075	-0.070	-0.217	-0.055
		0.000	*0.000*	*0.009*	*0.236*	*0.002*	*0.000*	*0.049*	*0.188*	*0.219*	*0.000*	*0.402*
σ(ROA)	-0.864		0.407	-0.008	0.176	-0.019	0.154	-0.297	-0.096	0.141	0.110	0.138
	0.000		*0.000*	*0.894*	*0.002*	*0.752*	*0.008*	*0.000*	*0.094*	*0.014*	*0.076*	*0.034*
RETURN_VOL	-0.584	0.593		-0.011	0.136	-0.150	0.241	-0.231	-0.086	0.083	0.032	0.061
	0.000	*0.000*		*0.854*	*0.020*	*0.013*	*0.000*	*0.000*	*0.146*	*0.161*	*0.622*	*0.369*
RETURN_CRISIS	0.148	-0.011	-0.094		0.087	0.029	0.150	-0.354	-0.194	-0.008	-0.029	0.083
	0.011	*0.853*	*0.113*		*0.135*	*0.631*	*0.011*	*0.000*	*0.001*	*0.886*	*0.651*	*0.209*
OWNMAN	0.162	-0.001	-0.108	0.197		0.361	0.163	-0.175	-0.090	0.035	-0.014	0.129
	0.004	*0.984*	*0.066*	*0.001*		*0.000*	*0.005*	*0.002*	*0.115*	*0.541*	*0.817*	*0.047*
OWNMAN_USD	0.122	-0.041	-0.142	0.037	0.807		-0.227	0.119	-0.025	-0.054	-0.038	-0.449
	0.040	*0.492*	*0.020*	*0.543*	*0.000*		*0.000*	*0.044*	*0.669*	*0.360*	*0.558*	*0.000*
LARGESTOWNER	-0.096	0.172	0.151	0.181	0.044	-0.105		-0.189	-0.106	0.190	0.014	0.129
	0.098	*0.003*	*0.011*	*0.002*	*0.452*	*0.081*		*0.001*	*0.068*	*0.001*	*0.829*	*0.050*
BANKSIZE	0.066	-0.321	-0.193	-0.359	-0.295	0.153	-0.225		0.505	-0.236	0.021	-0.337
	0.249	*0.000*	*0.001*	*0.000*	*0.000*	*0.010*	*0.000*		*0.000*	*0.000*	*0.734*	*0.000*
TOOBIGTOFAIL	0.070	-0.205	-0.064	-0.219	-0.223	-0.019	-0.147	0.452		-0.014	-0.039	-0.099
	0.224	*0.000*	*0.274*	*0.000*	*0.000*	*0.749*	*0.011*	*0.000*		*0.806*	*0.534*	*0.129*
BANKGROWTH	-0.144	0.190	0.307	0.113	-0.013	-0.092	0.050	-0.248	0.009		-0.149	0.135
	0.012	*0.001*	*0.000*	*0.052*	*0.826*	*0.121*	*0.391*	*0.000*	*0.882*		*0.016*	*0.038*
LLP	-0.206	0.138	0.165	0.013	-0.175	-0.026	-0.064	0.153	0.051	0.091		-0.103
	0.001	0.027	0.010	0.843	0.005	0.689	0.308	0.014	0.410	0.143		0.152
FIXED PAY	-0.001	-0.019	0.014	0.092	-0.172	-0.466	0.113	-0.312	-0.103	0.099	-0.065	
	0.984	*0.775*	*0.831*	*0.166*	*0.008*	*0.000*	*0.085*	*0.000*	*0.115*	*0.130*	*0.363*	

Table 3: Risk-taking incentives and stock price level

This table shows how bank risk measures differ across two categories of banks based on initial stock price levels. Stock price level is measured at the end of 2000 and available for 230 banks from the original sample of 307 banks. The sample is divided in two groups based on the level of the share price in USD. Group 1 contains banks in the bottom quartile, Group 2 the other observations. The first half of the table shows average and median stock price per share information in USD. Mean and median differences between each of the seven variables are shown in the second half of the table. One-sided p-values indicate the significance level of the differences between Group 1 and Group 2. Variables are averaged or measured over the period of 2000 through 2007. Z-score measured as ROA plus capital-asset ratio divided by the standard deviation of ROA. σ(ROA) is the standard deviation of ROA. RETURN_VOL is stock return volatility measured as the standard deviation of the bank's monthly stock returns from 2000 through 2007. RETURN_CRISIS is stock returns during the financial crisis measured as the compounded monthly returns measured over 21 months between April 1, 2007, and December 31, 2008. σ(LLP) is the standard deviation of loan loss provision. LLP is the amount of loan loss provisions scaled by net interest income averaged over the period of 2000 through 2007. BANKGROWTH is the annual increase in net interest income.

		Low initial stock price 2000 (Q1)	Low initial stock price 2000 (Q1)	Other observations	Other observations		
		Mean	*Median*	*Mean*	*Median*		
	Price per share in USD	0.59	0.46	26.31	19.75		
	N Observations	51	51	179	179		
	Indicator	*Mean*	*Median*	*Mean*	*Median*	*P(t-stat) 1sided*	*P(z-stat) 1sided*
1	z-score	3.4564	3.4503	3.6596	3.7499	*0.091**	*0.085**
2	σ(ROA)	0.0136	0.0042	0.0053	0.0021	*0.000****	*0.001****
3	RETURN_VOL	0.1014	0.0903	0.0792	0.0706	*0.000****	*0.000****
4	RETURN_CRISIS	-0.4395	-0.4582	-0.3987	-0.3625	*0.325*	*0.141*
5	σ(LLP)	0.2809	0.0906	0.0906	0.0357	*0.017***	*0.000****
6	LLP	0.2209	0.1661	0.0985	0.0706	*0.001****	*0.001****
7	BANKGROWTH	0.1757	0.1370	0.0940	0.0824	*0.042***	*0.000****

Table 4: Bank stability and managerial ownership

This table presents regression results of z-score on managerial ownership. The sample consists of 307 listed banks in 37 countries. Unless indicated otherwise, variables are averaged or measured over the period of 2000 through 2007 with the requirement of at least three years of consecutive data for earnings, total assets, and equity available in Bankscope. Dependent variable is z-score measured as ROA plus the capital-asset ratio divided by the standard deviation of ROA. In specification 10, z-score *full data* is the z-score measured for banks for which earnings, assets, and equity data are available for every year from 2000 through 2007. In specification 11, z-score *2000-2010* is the z-score measured for the period of 2000 through 2010. In specification 12, dependent variable is σ(ROA) measured as the standard deviation of ROA. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. DUMMY_OWNMAN is a dummy variable equal to 1 if managerial ownership (OWNMAN) exceeds 5% of the bank's outstanding shares and 0 otherwise. In specifications 4 and 8, OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder. BANKSIZE is the log of total assets in million USD. TOOBIGTOFAIL is a dummy equal to 1 for banks that are one of the three biggest in their country. BANKGROWTH is the annual increase in net interest income. LLP is the amount of loan loss provisions scaled by net interest income. GDPCAPITA is the log of gross domestic product per capita, except for specifications 4 and 8, where it is the log of gross domestic product per capita orthogonolized on OWNMAN in dollars. FIXEDPAY is the ratio of fixed pay on total pay averaged over all managers with data available. Fixed pay only includes the managers' fixed salary; all other forms of remuneration, such as annual bonuses and long-term incentive compensation, are considered to be variable pay. Specification 5 includes country fixed effects. All regressions are estimated by means of ordinary least squares and include an intercept (not reported). Standard errors are clustered at the country level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	z-score	small/large managerial ownership	excl. OWNMAN > 5%	managerial ownership in ths USD	largest shareholder	bank controls	excl. OWNMAN > 5%	managerial ownership in ths USD
SPECIFICATION	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OWNMAN	-0.7276	18.4076***	18.6944***	0.0443***	16.6715***	16.7470***	16.0344***	0.0353*
	(0.7246)	(4.7851)	(4.7760)	(0.0153)	(5.0964)	(5.0338)	(5.1161)	(0.0195)
DUMMY_OWNMAN		-0.2785			-0.3720*	-0.3875		
		(0.2101)			(0.2148)	(0.2377)		
OWNMAN*DUMMY_OWNMAN		-18.3270***			-16.0541***	-16.0112***		
		(4.7377)			(5.0878)	(5.1299)		
LARGESTOWNER					-1.1599***	-0.8438**	-0.8581**	-0.7942*
					(0.2978)	(0.3345)	(0.3444)	(0.4480)
BANKGROWTH						-0.4116**	-0.3373**	-0.2953
						(0.1909)	(0.1600)	(0.2102)
BANKSIZE						-0.0083	-0.0208	-0.0131
						(0.0471)	(0.0491)	(0.0570)
TOOBIGTOFAIL						0.2941	0.2840	0.2565
						(0.1987)	(0.2104)	(0.2113)
LLP						-0.7305***	-0.7724***	-0.7316***
						(0.1473)	(0.1423)	(0.1722)
GDPCAPITA						0.1269	0.1315	0.1858
						(0.0851)	(0.0861)	(0.1185)
FIXEDPAY								
Observations	307	307	270	286	302	253	224	241
R-squared	0.0046	0.0522	0.0443	0.0330	0.1037	0.2033	0.2087	0.1641

Table 4: Bank stability and managerial ownership (cont.)

This table presents regression results of z-score on managerial ownership. The sample consists of 307 listed banks in 37 countries. Unless indicated otherwise, variables are averaged or measured over the period of 2000 through 2007 with the requirement of at least three years of consecutive data for earnings, total assets, and equity available in Bankscope. Dependent variable is z-score measured as ROA plus the capital-asset ratio divided by the standard deviation of ROA. In specification 10, z-score *full data* is the z-score measured for banks for which earnings, assets, and equity data are available for every year from 2000 through 2007. In specification 11, z-score *2000-2010* is the z-score measured for the period of 2000 through 2010. In specification 12, dependent variable is σ(ROA) measured as the standard deviation of ROA. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. DUMMY_OWNMAN is a dummy variable equal to 1 if managerial ownership (OWNMAN) exceeds 5% of the bank's outstanding shares and 0 otherwise. In specifications 4 and 8, OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder. BANKSIZE is the log of total assets in million USD. TOOBIGTOFAIL is a dummy equal to 1 for banks that are one of the three biggest in their country. BANKGROWTH is the annual increase in net interest income. LLP is the amount of loan loss provisions scaled by net interest income. GDPCAPITA is the log of gross domestic product per capita, except for specifications 4 and 8, where it is the log of gross domestic product per capita orthogonolized on OWNMAN in dollars. FIXEDPAY is the ratio of fixed pay on total pay averaged over all managers with data available. Fixed pay only includes the managers' fixed salary; all other forms of remuneration, such as annual bonuses and long-term incentive compensation, are considered to be variable pay. Specification 5 includes country fixed effects. All regressions are estimated by means of ordinary least squares and include an intercept (not reported). Standard errors are clustered at the country level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	country fixed effects	z-score full data	z-score 2000-2010	Dep. Var.: σ(ROA)	fixed pay on total pay
SPECIFICATION	(9)	(10)	(11)	(12)	(13)
OWNMAN	12.4033***	24.7957**	11.2821***	-0.1726**	17.3113***
	(3.7710)	(9.3473)	(3.4409)	(0.0820)	(5.6949)
DUMMY_OWNMAN	-0.1709	0.2296	-0.3337	0.0120	-0.2325
	(0.2431)	(0.3676)	(0.2766)	(0.0095)	(0.2672)
OWNMAN*DUMMY_OWNMAN	-12.0015***	-25.1236**	-10.4699***	0.1682**	-17.0066***
	(4.0662)	(9.2022)	(3.5555)	(0.0772)	(5.7988)
LARGESTOWNER	-0.6819**	-2.1422***	-0.3414	0.0108*	-0.7553*
	(0.3266)	(0.6635)	(0.2765)	(0.0057)	(0.3908)
BANKGROWTH	-0.3516*	-0.2604	-0.2358	0.0177**	-0.3879
	(0.1767)	(0.3661)	(0.1606)	(0.0078)	(0.2425)
BANKSIZE	-0.0249	0.0101	-0.0002	-0.0020**	0.0221
	(0.0554)	(0.0536)	(0.0300)	(0.0009)	(0.0597)
TOOBIGTOFAIL	0.3151	-0.1531	0.2285*	0.0013	0.3224
	(0.1983)	(0.2152)	(0.1219)	(0.0018)	(0.2396)
LLP	-0.5956***	-0.5289	-0.3585**	0.0122	-0.7192***
	(0.1360)	(0.3486)	(0.1766)	(0.0073)	(0.1835)
GDPCAPITA		0.02510	-0.0511	0.0005	0.1711
		(0.1625)	(0.0680)	(0.0015)	(0.1046)
FIXEDPAY					0.2104
					(0.3463)
Observations	253	108	253	253	190
R-squared	0.1123	0.2450	0.0542	0.2794	0.1820

Table 5: Return volatility and managerial ownership

This table presents regression results of return volatility on managerial ownership. The sample consists of 307 listed banks in 37 countries. Unless indicated otherwise, variables are averaged or measured over the period of 2000 through 2007 with the requirement of at least three years of consecutive data for earnings, total assets, and equity available in Bankscope. Dependent variable is stock return volatility measured as the standard deviation of the bank's monthly stock returns from 2000 through 2007 and winsorized at the top and bottom percentile. In specification 10, return volatility is measured for the period of 2000 through 2010. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. DUMMY_LARGEOWN is a dummy variable equal to 1 if managerial ownership (OWNMAN) exceeds 5% of the bank's outstanding shares and 0 otherwise. In specifications 4 and 8, OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder. BANKSIZE is the log of total assets in million USD. TOOBIGTOFAIL is a dummy equal to 1 for banks that are one of the three biggest in their country. BANKGROWTH is the annual increase in net interest income. LLP is the amount of loan loss provisions scaled by net interest income. GDPCAPITA is the log of gross domestic product per capita, except for specifications 4 and 8, where it is the log of gross domestic product per capita orthogonolized on OWNMAN in dollars. FIXEDPAY is the ratio of fixed pay on total pay averaged over all managers with data available. Fixed pay only includes the managers' fixed salary; all other forms of remuneration, such as annual bonuses and long-term incentive compensation, are considered to be variable pay. Specification 9 includes country fixed effects. All regressions are estimated by means of ordinary least squares and include an intercept (not reported). Standard errors are clustered at the country level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	return volatility	small/large managerial ownership	excl. OWNMAN > 5%	managerial ownership in ths USD	largest shareholder	bank controls	excl. OWNMAN > 5%	managerial ownership in ths USD
SPECIFICATION	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OWNMAN	0.0370	-0.5351**	-0.5437**	-0.0022***	-0.4228**	-0.4613**	-0.4465**	-0.0018***
	(0.0273)	(0.2019)	(0.2010)	(0.0007)	(0.1969)	(0.2028)	(0.2046)	(0.0006)
DUMMY_OWNMAN		0.0085			0.0086	-0.0017		
		(0.0096)			(0.0092)	(0.0102)		
OWNMAN*DUMMY_OWNMAN		0.5484**			0.4165**	0.4598**		
		(0.2043)			(0.2001)	(0.2052)		
LARGESTOWNER					0.0585***	0.0410**	0.0441**	0.0378*
					(0.0172)	(0.0169)	(0.0176)	(0.0192)
BANKGROWTH						0.0143**	0.0202***	0.0142*
						(0.0067)	(0.0074)	(0.0080)
BANKSIZE						-0.0031**	-0.0030*	-0.0025
						(0.0015)	(0.0015)	(0.0015)
TOOBIGTOFAIL						-0.0027	-0.0023	-0.0030
						(0.0048)	(0.0050)	(0.0048)
LLP						0.0030	0.0052	-0.0003
						(0.0077)	(0.0079)	(0.0108)
GDPCAPITA						-0.0099***	-0.0097***	-0.0113***
						(0.0025)	(0.0024)	(0.0031)
FIXEDPAY								
Observations	303	303	268	284	298	250	225	239
R-squared	0.009	0.0412	0.0289	0.0591	0.1255	0.3348	0.3668	0.3325

Table 5: Return volatility and managerial ownership (cont.)

This table presents regression results of return volatility on managerial ownership. The sample consists of 307 listed banks in 37 countries. Unless indicated otherwise, variables are averaged or measured over the period of 2000 through 2007 with the requirement of at least three years of consecutive data for earnings, total assets, and equity available in Bankscope. Dependent variable is stock return volatility measured as the standard deviation of the bank's monthly stock returns from 2000 through 2007 and winsorized at the top and bottom percentile. In specification 10, return volatility is measured for the period of 2000 through 2010. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. DUMMY_OWNMAN is a dummy variable equal to 1 if managerial ownership (OWNMAN) exceeds 5% of the bank's outstanding shares and 0 otherwise. In specifications 4 and 8, OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder. BANKSIZE is the log of total assets in million USD. TOOBIGTOFAIL is a dummy equal to 1 for banks that are one of the three biggest in their country. BANKGROWTH is the annual increase in net interest income. LLP is the amount of loan loss provisions scaled by net interest income. GDPCAPITA is the log of gross domestic product per capita, except for specifications 4 and 8, where it is the log of gross domestic product per capita orthogonolized on OWNMAN in dollars. FIXEDPAY is the ratio of fixed pay on total pay averaged over all managers with data available. Fixed pay only includes the managers' fixed salary; all other forms of remuneration, such as annual bonuses and long-term incentive compensation, are considered to be variable pay. Specification 9 includes country fixed effects. All regressions are estimated by means of ordinary least squares and include an intercept (not reported). Standard errors are clustered at the country level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	country fixed effects	return volatility 2000-2010	fixed pay on total pay
SPECIFICATION	(9)	(10)	(11)
OWNMAN	-0.3016**	-0.3938*	-0.5346**
	(0.1299)	(0.1977)	(0.2462)
DUMMY_OWNMAN	-0.0106	-0.0065	-0.0148
	(0.0092)	(0.0115)	(0.0117)
OWNMAN*DUMMY_OWNMAN	0.3199**	0.3878*	0.5711**
	(0.1340)	(0.2027)	(0.2506)
LARGESTOWNER	0.0266**	0.0101	0.0117
	(0.0126)	(0.0144)	(0.0161)
BANKGROWTH	0.0097	0.0086	0.0218***
	(0.0068)	(0.0088)	(0.0059)
BANKSIZE	-0.0035*	-0.0011	-0.0046**
	(0.0020)	(0.0014)	(0.0017)
TOOBIGTOFAIL	-0.0002	0.0019	-0.0026
	(0.0046)	(0.0061)	(0.0045)
LLP	-0.0024	0.0025	0.0114*
	(0.0086)	(0.0089)	(0.0062)
GDPCAPITA		-0.0045*	-0.0105***
		(0.0024)	(0.0028)
FIXEDPAY			-0.0237***
			(0.0065)
Observations	250	251	189
R-squared	0.1162	0.0646	0.3323

Table 6: Bank ownership characteristics

This table presents regression results of z-score (models 1-4) and return volatility (model 5-8) on managerial ownership and ownership structure. In Panel A, the presence of a large owner in the board of directors is investigated. In Panel B, the presence of state ownership is investigated. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. DUMMY_OWNMAN is a dummy variable equal to 1 if managerial ownership (OWNMAN) exceeds 5% of the bank's outstanding shares and 0 otherwise. In specifications 2, 4, 6 and 8, OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. EXTERNAL_OWNER_IN_BOARD captures the presence of a non-executive, large owner (at least 5% of shares outstanding) in the board of directors. In specifications 1, 2, 5 and 6 of Panel A, EXTERNAL_OWNER_IN_BOARD is a dummy variable equal to 1 if there is a large owner seating in the board of directors of the bank any time during the period 2005-2007, and 0 otherwise. In specifications 3, 4, 7 and 8 of Panel A, EXTERNAL_OWNER_IN_BOARD equals the percentage of equity that the largest non-executive owner seated in the board owns, measured in 2005. Ownership stakes below 5% are considered as zero. STATE_OWNER captures the presence of the state, country or government as a shareholder of the bank (at least 5% of shares outstanding). In specifications 1, 2, 5 and 6 of Panel B, STATE_OWNER is a dummy variable equal to 1 if the state (or a state-related party) is a shareholder of the bank at any point time during the period 2005-2007, and 0 otherwise. In specifications 3, 4, 7 and 8 of Panel B, STATE_OWNER equals the percentage of equity that the state or government owns in the bank, averaged over 2005-2007. Ownership stakes below 5% are considered as zero. Control variables in both panels (not reported) are BANKGROWTH and GDPCAPITA, as in Table 4 (p.270) in Laeven and Levine (2009). All regressions are estimated by means of ordinary least squares and include an intercept (not reported). Standard errors are clustered at the country level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: External (large) owner present in the board of directors of the bank

Variables	dep. var.: **z-score**				dep. var.: **Return Volatility**			
	Presence of an external (large) owner in board	managerial ownership in ths USD	Stake of the external (large) owner in board	managerial ownership in ths USD	Presence of an external (large) owner in board	managerial ownership in ths USD	Stake of the external (large) owner in board	managerial ownership in ths USD
Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OWNMAN	15.8530***	0.0317*	10.0967**	0.0166	-0.5931**	-0.0018**	-0.3826	-0.0014*
	(4.9416)	(0.0179)	(4.1152)	(0.0219)	(0.2292)	(0.0008)	(0.2368)	(0.0008)
DUMMY_OWNMAN	-0.3414**		-0.3480*		0.0057		0.0060	
	(0.1633)		(0.1847)		(0.0095)		(0.0104)	
OWNMAN*DUMMY_OWNMAN	-15.3978***		-9.5818**		0.5999**		0.3824	
	(4.9226)		(4.0427)		(0.2317)		(0.2381)	
EXTERNAL_OWNER_IN_BOARD	-0.4840***	-0.4843**	-1.0417**	-1.3434**	0.0156**	0.0112*	0.0481**	0.0508**
	(0.1690)	(0.1829)	(0.4542)	(0.5818)	(0.0067)	(0.0063)	(0.0198)	(0.0238)
Control Variables	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Observations	258	241	238	222	255	240	235	221
R-squared	0.1185	0.1349	0.0821	0.1010	0.1550	0.2970	0.1280	0.2898

Table 6: Bank ownership characteristics (Cont.)

This table presents regression results of z-score (models 1-4) and return volatility (model 5-8) on managerial ownership and ownership structure. In Panel A, the presence of a large owner in the board of directors is investigated. In Panel B, the presence of state ownership is investigated. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. DUMMY_OWNMAN is a dummy variable equal to 1 if managerial ownership (OWNMAN) exceeds 5% of the bank's outstanding shares and 0 otherwise. In specifications 2, 4, 6 and 8, OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. EXTERNAL_OWNER_IN_BOARD captures the presence of a non-executive, large owner (at least 5% of shares outstanding) in the board of directors. In specifications 1, 2, 5 and 6 of Panel A, EXTERNAL_OWNER_IN_BOARD is a dummy variable equal to 1 if there is a large owner seating in the board of directors of the bank any time during the period 2005-2007, and 0 otherwise. In specifications 3, 4, 7 and 8 of Panel A, EXTERNAL_OWNER_IN_BOARD equals the percentage of equity that the largest non-executive owner seated in the board owns, measured in 2005. Ownership stakes below 5% are considered as zero. STATE_OWNER captures the presence of the state, country or government as a shareholder of the bank (at least 5% of shares outstanding). In specifications 1, 2, 5 and 6 of Panel B, STATE_OWNER is a dummy variable equal to 1 if the state (or a state-related party) is a shareholder of the bank at any point time during the period 2005-2007, and 0 otherwise. In specifications 3, 4, 7 and 8 of Panel B, STATE_OWNER equals the percentage of equity that the state or government owns in the bank, averaged over 2005-2007. Ownership stakes below 5% are considered as zero. Control variables in both panels (not reported) are BANKGROWTH and GDPCAPITA, as in Table 4 (p.270) in Laeven and Levine (2009). All regressions are estimated by means of ordinary least squares and include an intercept (not reported). Standard errors are clustered at the country level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel B: State ownership in the bank

Variables	dep. var.: z-score				dep. var.: Return Volatility			
	presence of a state owner	managerial ownership in ths USD	stake of state ownership	managerial ownership in ths USD	presence of a state owner	managerial ownership in ths USD	stake of state ownership	managerial ownership in ths USD
Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OWNMAN	18.7864***	0.0311**	19.4906***	0.0346**	-0.6715***	-0.0018***	-0.6798***	-0.0017***
	(4.9876)	(0.0150)	(5.2039)	(0.0155)	(0.2038)	(0.0006)	(0.2065)	(0.0006)
DUMMY_OWNMAN	-0.1226		-0.1058		-0.0027		-0.0017	
	(0.1522)		(0.1565)		(0.0091)		(0.0086)	
OWNMAN*DUMMY_OWNMAN	-19.0200***		-19.7135***		0.6986***		0.7041***	
	(4.9088)		(5.0950)		(0.2054)		(0.2069)	
STATE_OWNER	-0.8072**	-0.5694*	-1.3968**	-0.9227	0.0261***	0.0084	0.0595***	0.0269
	(0.3125)	(0.3234)	(0.5374)	(0.6356)	(0.0081)	(0.0083)	(0.0170)	(0.0191)
Control Variables	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Observations	303	284	301	283	299	282	297	281
R-squared	0.1166	0.1085	0.1024	0.1029	0.1647	0.2680	0.1714	0.2721

Table 7: Stock returns during the crisis and managerial ownership

This table presents regression results of stock returns during the financial crisis on managerial ownership. The sample consists of 307 listed banks in 37 countries. Regression variables are measured or averaged over the period of 2000 through 2007. Dependent variable is stock returns during the financial crisis measured as the compounded monthly returns measured over 21 months between April 1, 2007, and December 31, 2008. In specification 8, crisis returns are measured by calculating the percentage change in stock price between April 1, 2007, and December 30, 2008. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank. DUMMY_OWNMAN is a dummy variable equal to 1 if managerial ownership (OWNMAN) exceeds 5% of the bank's outstanding shares and 0 otherwise. In specifications 6 and 7, OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder. BANKSIZE is the log of total assets in million USD. TOOBIGTOFAIL is a dummy equal to 1 for banks that are one of the three biggest in their country. BANKGROWTH is the annual increase in net interest income. GDPCAPITA is the log of gross domestic product per capita. All regressions are estimated by means of ordinary least squares and include an intercept (not reported). Standard errors are clustered at the country level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	compound monthly returns during crisis	small/large managerial ownership	largest shareholder	bank controls	excl. OWNMAN > 5%	managerial ownership in ths USD	managerial ownership in ths USD & excl. OWNMAN >5%	dep. var.: % change in stock price during crisis
SPECIFICATION	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OWNMAN	0.2606	4.3026***	4.6894***	2.8529**	2.9931**	0.0072	0.0090*	3.1280**
	(0.2577)	(1.4057)	(1.2615)	(1.3829)	(1.4148)	(0.0055)	(0.0047)	(1.2453)
DUMMY_OWNMAN		0.1671*	0.1442	0.0686				0.0775
		(0.0976)	(0.1094)	(0.1012)				(0.1028)
OWNMAN*DUMMY_OWNMAN		-4.4228***	-4.8397***	-2.9513**				-3.2405**
		(1.4764)	(1.3303)	(1.4310)				(1.2995)
LARGESTOWNER			0.2010	0.0874	0.0819	0.1202	0.1499	0.0856
			(0.1328)	(0.1213)	(0.1247)	(0.1139)	(0.1093)	(0.1142)
BANKSIZE				-0.0400**	-0.0456***	-0.0473***	-0.0559***	-0.0391**
				(0.0160)	(0.0154)	(0.0152)	(0.0142)	(0.0148)
TOOBIGTOFAIL				-0.0311	-0.0009	-0.0325	0.0018	-0.0301
				(0.0424)	(0.0407)	(0.0396)	(0.0402)	(0.0414)
BANKGROWTH				-0.0224	-0.0182	0.0361	0.0525*	-0.0289
				(0.0452)	(0.0362)	(0.0500)	(0.0261)	(0.0446)
GDPCAPITA				-0.0149	-0.0220	-0.0105	-0.0190	-0.0156
				(0.0338)	(0.0352)	(0.0326)	(0.0335)	(0.0332)
Observations	298	298	293	289	257	273	245	290
R-squared	0.0065	0.0353	0.0470	0.1307	0.1627	0.1460	0.1912	0.1301

Table 8: Interactions between managerial ownership and bank regulation

This table presents regression results of z-score (specifications 1-4) and return volatility (specification 5) on managerial ownership, ownership structure, and bank regulation. OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD. LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder. Control variables (not reported) are the same as in previous models. DI is a dummy variable equal to 1 for countries with explicit deposit insurance. CAPREQ is the minimal capital assets ratio requirement. CAPSTR is an index of capital regulation. CAPRESTR is an index of activity restrictions. These four variables stem from Barth et al. (2006). All regressions are estimated by means of ordinary least squares and include an intercept (not reported). Standard errors are clustered at the country level and reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

VARIABLES	no interactions	OWNMAN interactions	LARGESTOWNER interactions	full model	dep. var.: Return Volatility
SPECIFICATION	(1)	(2)	(3)	(4)	(5)
OWNMAN	0.0305	0.2448*	0.0325	0.3844*	-0.0176**
	(0.0219)	(0.1281)	(0.0222)	(0.2131)	(0.0084)
LARGESTOWNER	-1.0708***	-1.1052***	3.5454**	6.5370***	-0.4461**
	(0.3586)	(0.3752)	(1.4897)	(2.3636)	(0.1914)
Deposit_insurance (DI)	-0.4903	0.2097	-0.6861	0.4034	0.0085
	(0.5042)	(0.6961)	(0.4788)	(0.9715)	(0.0348)
Capital_requirements (CAPREQ)	-0.0656	0.1177	0.0477	0.3873**	-0.0167**
	(0.1468)	(0.1101)	(0.1504)	(0.1822)	(0.0077)
Capital_stringency (CAPSTR)	0.0591	-0.0128	0.1844	0.0916	-0.0078
	(0.1483)	(0.2132)	(0.1645)	(0.2998)	(0.0112)
Capital_restrictions (CAPRESTR)	-0.0154	-0.0520	-0.0285	-0.0548	0.0024
	(0.0400)	(0.0791)	(0.0487)	(0.1008)	(0.0028)
OWNMAN*DI		-0.1059**		-0.1177	0.0020
		(0.0489)		(0.0719)	(0.0029)
OWNMAN*CAPREQ		-0.0253**		-0.0373*	0.0017*
		(0.0121)		(0.0213)	(0.0008)
OWNMAN*CAPSTR		0.0097		0.0053	0.0000
		(0.0162)		(0.0229)	(0.0010)
OWNMAN*CAPRESTR		0.0051		0.0040	-0.0001
		(0.0073)		(0.0083)	(0.0002)
LARGESTOWNER*DI			1.3192**	-0.0238	0.0951
			(0.6286)	(1.0788)	(0.0676)
LARGESTOWNER*CAPREQ			-0.4709***	-0.7670***	0.0399**
			(0.1362)	(0.2169)	(0.0165)
LARGESTOWNER*CAPSTR			-0.7676***	-0.6107	-0.0100
			(0.2785)	(0.3790)	(0.0234)
LARGESTOWNER*CAPRESTR			0.0721	0.0918	0.0108
			(0.1604)	(0.1726)	(0.0070)
Control Variables	incl.	incl.	incl.	incl.	incl.
Observations	264	264	264	264	262
R-squared	0.1281	0.1537	0.1456	0.1751	0.3964

Table 9: Bank-year regressions (panel)

This table presents panel regression results of return volatility on managerial ownership. The sample consists of 1,988 bank-year observations in 37 countries. Specifications 1-7 are based on 1,104 bank-year observations from the period of 2000 through 2007. Specifications 8-10 are based on 884 bank-year observations from the period of 2008 through 2010. Dependent variable is return volatility measured as the yearly standard deviation of monthly stock returns, winsorized at the top and bottom percentile. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank, measured per year. DUMMY_LARGEOWN is a dummy variable equal to 1 if managerial ownership (OWNMAN) exceeds 5% of the bank's outstanding shares and 0 otherwise. In specifications 6 and 10, OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD, measured per year. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder, measured per year. BANKSIZE is the log of total assets in million USD. TOOBIGTOFAIL is a dummy equal to 1 for banks that are one of the three biggest in their country. BANKGROWTH is the annual increase in net interest income. LLP is the amount of loan loss provisions scaled by net interest income. GDPCAPITA is the log of gross domestic product per capita. FIXEDPAY is the ratio of fixed pay on total pay averaged over all managers with data available, measured by year. Fixed pay only includes the managers' fixed salary; all other forms of remuneration such as annual bonuses and long-term incentive compensation are considered to be variable pay. All regressions are estimated by means of ordinary least squares and include year effects and an intercept (both not reported). Standard errors are clustered at the country level and reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

VARIABLES	Dependent variable: return volatility in period (2000-2007)					
	return volatility	largest shareholder	bank controls	excl. OWNMAN > 5%	managerial ownership in ths USD	fixed pay on total pay
SPECIFICATION	(1)	(2)	(3)	(4)	(5)	(6)
OWNMAN	-0.6881***	-0.7321***	-0.4191**	-0.4035**	-0.0012**	-0.3773*
	(0.1400)	(0.1315)	(0.1874)	(0.1831)	(0.0005)	(0.2164)
DUMMY_OWNMAN	-0.0109	-0.0038	0.0014			-0.0017
	(0.0073)	(0.0102)	(0.0067)			(0.0078)
OWNMAN*DUMMY_OWNMAN	0.7398***	0.7565***	0.4298**			0.3922*
	(0.1264)	(0.1284)	(0.1888)			(0.2286)
LARGESTOWNER		0.0536***	0.0363**	0.0408**	0.0327**	0.0576***
		(0.0186)	(0.0148)	(0.0150)	(0.0143)	(0.0129)
BANKGROWTH			0.0157	0.0012	0.0201*	0.0138
			(0.0104)	(0.0074)	(0.0111)	(0.0082)
BANKSIZE			-0.0013	-0.0008	-0.0004	-0.0017
			(0.0008)	(0.0009)	(0.0010)	(0.0013)
TOOBIGTOFAIL			0.0077	0.0061	0.0058	0.0065
			(0.0055)	(0.0059)	(0.0045)	(0.0050)
LLP			-0.0000	0.0027	-0.0009	0.0012
			(0.0105)	(0.0100)	(0.0106)	(0.0143)
GDPCAPITA			-0.0122***	-0.0121***	-0.0117***	-0.0121***
			(0.0027)	(0.0026)	(0.0023)	(0.0026)
FIXEDPAY						0.0096
						(0.0090)
Observations	1,182	941	645	582	629	479
R-squared	0.1158	0.1681	0.4001	0.4035	0.4037	0.5098

Table 9: Bank-year regressions (panel) (Cont.)

This table presents panel regression results of return volatility on managerial ownership. The sample consists of 1,988 bank-year observations in 37 countries. Specifications 1-7 are based on 1,104 bank-year observations from the period of 2000 through 2007. Specifications 8-10 are based on 884 bank-year observations from the period of 2008 through 2010. Dependent variable is return volatility measured as the yearly standard deviation of monthly stock returns, winsorized at the top and bottom percentile. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank, measured per year. DUMMY_LARGEOWN is a dummy variable equal to 1 if managerial ownership (OWNMAN) exceeds 5% of the bank's outstanding shares and 0 otherwise. In specifications 6 and 10, OWNMAN is the natural logarithm of managerial ownership expressed in thousand USD, measured per year. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder, measured per year. BANKSIZE is the log of total assets in million USD. TOOBIGTOFAIL is a dummy equal to 1 for banks that are one of the three biggest in their country. BANKGROWTH is the annual increase in net interest income. LLP is the amount of loan loss provisions scaled by net interest income. GDPCAPITA is the log of gross domestic product per capita. FIXEDPAY is the ratio of fixed pay on total pay averaged over all managers with data available, measured by year. Fixed pay only includes the managers' fixed salary; all other forms of remuneration such as annual bonuses and long-term incentive compensation are considered to be variable pay. All regressions are estimated by means of ordinary least squares and include year effects and an intercept (both not reported). Standard errors are clustered at the country level and reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

VARIABLES	Dependent variable: return volatility in post-crisis period (2008-2010)		
	return volatility - bank controls	excl. OWNMAN > 5%	managerial ownership in ths USD
SPECIFICATION	(7)	(8)	(9)
OWNMAN	-0.6879***	-0.6415**	-0.0020**
	(0.1970)	(0.3145)	(0.0010)
DUMMY_OWNMAN	0.0009		
	(0.0098)		
OWNMAN*DUMMY_OWNMAN	0.7095***		
	(0.2010)		
LARGESTOWNER	0.0270***	0.0305	0.0229
	(0.0099)	(0.0216)	(0.0196)
BANKGROWTH	-0.0083	-0.0114	-0.0054
	(0.0056)	(0.0105)	(0.0106)
BANKSIZE	0.0064***	0.0070***	0.0079***
	(0.0011)	(0.0020)	(0.0017)
TOOBIGTOFAIL	0.0202***	0.0187	0.0158
	(0.0069)	(0.0123)	(0.0102)
LLP	0.0171	0.0164	0.0124
	(0.0106)	(0.0104)	(0.0084)
GDPCAPITA	-0.0123***	-0.0129***	-0.0116***
	(0.0018)	(0.0042)	(0.0034)
FIXEDPAY			
Observations	826	747	790
R-squared	0.2511	0.2706	0.2538

Appendix 1: Bank risk, ownership and regulation by country

Z-score is measured as ROA plus the capital-asset ratio divided by the standard deviation of ROA, measured over the period of 2000 through 2007. RETURN_VOL is stock return volatility measured as the standard deviation of the bank's monthly stock returns from 2000 through 2007. RETURN_CRISIS is stock returns during the financial crisis measured as the compounded monthly returns measured over 21 months between April 1, 2007, and December 31, 2008. OWNMAN is the percentage or fraction of the bank's total outstanding shares held by, data permitting, the five best-paid managers in the bank, averaged per country. OWNMAN_USD is the natural logarithm of managerial ownership expressed in thousand USD. Dollar value of managerial ownership is measured by multiplying the share price at the end of each fiscal year in USD with the amount of shares owned by, data permitting, the top five managers. LARGESTOWNER is the fraction of the bank's shares held by the largest shareholder. BANKSIZE is the log of total assets in million USD. GDP_CAPITA is the log of gross domestic product per capita. DI is a dummy variable equal to 1 for countries with explicit deposit insurance. CAPREQ is the minimal capital assets ratio requirement. CAPSTR is an index of capital regulation. CAPRESTR is an index of activity restrictions. The latter four variables stem from Barth et al. (2006).

Country	# BANKS	z-score	RETURN VOL	RETURN CRISIS	OWNMAN	OWNMAN (median)	OWNMAN USD	LARGEST OWNER	GDP CAPITA	DI	CAP REQ	CAP STR	CAP RESTR
ARGENTINA	3	0.929	0.217	0.417	0.213	0.250	9.257	0.465	9.039	1	11.5	3	8.75
AUSTRALIA	2	4.831	0.057	0.623	0.042	0.042	9.474	0.038	10.077	0	8	3	8
AUSTRIA	5	3.641	0.054	0.706	0.008	0.000	4.136	0.186	10.147	1	8	5	5
BELGIUM	4	3.751	0.073	0.264	0.000	0.000	4.550	0.220	10.081	1	8	4	9
BRAZIL	4	3.315	0.085	0.769	0.140	0.107	6.784	0.235	8.310	1	11	5	10
CANADA	1	3.857	0.061	1.045	0.000	0.000	5.239	0.000	10.128	1	8	4	7
DENMARK	4	3.936	0.060	0.265	0.001	0.001	3.583	0.159	10.341	1	8	2	8
FINLAND	4	2.979	0.067	0.756	0.004	0.000	7.549	0.195	10.171	1	8	4	7
FRANCE	4	3.916	0.067	0.272	0.000	0.000	4.468	0.086	10.029	1	8	2	6
GERMANY	7	2.274	0.118	0.313	0.022	0.000	5.728	0.126	10.088	1	8	1	5
GREECE	3	2.892	0.108	0.335	0.037	0.000	7.503	0.295	9.499	1	8	3	9
HONG KONG	6	3.841	0.088	0.614	0.072	0.010	10.442	0.368	10.314	1	10	.	.
INDIA	6	3.847	0.139	1.159	0.021	0.000	4.218	0.255	6.366	1	8	3	10
INDONESIA	3	2.149	0.194	1.069	0.000	0.000	0.648	0.377	6.838	1	8	5	14
IRELAND	2	4.279	0.071	0.066	0.000	0.000	9.062	0.000	10.260	1	8	1	8
ISRAEL	4	2.984	0.073	0.502	0.001	0.000	5.076	0.270	9.924	0	9	3	13
ITALY	8	4.197	0.059	0.450	0.001	0.000	5.771	0.144	9.886	1	8	4	10
JAPAN	5	2.671	0.105	0.323	0.000	0.000	4.599	0.000	10.556	1	8	4	13
KOREA REP. OF	2	3.163	0.164	0.921	0.025	0.025	6.054	0.162	9.536	1	8	3	9
MALAYSIA	9	3.347	0.087	0.665	0.116	0.000	7.063	0.169	8.420	0	8	3	10
MEXICO	2	3.301	0.091	0.985	0.361	0.361	13.737	0.435	8.694	1	8	4	12
NETHERLANDS	6	4.033	0.080	0.417	0.008	0.000	7.157	0.142	10.146	1	8	3	6
NORWAY	8	3.706	0.068	0.400	0.001	0.000	5.255	0.060	10.591	1	8	.	.
PAKISTAN	8	2.667	0.111	0.405	0.008	0.000	0.173	0.155	6.375	0	8	.	.
PERU	1	2.172	0.199	1.000	0.000	0.000	5.156	0.970	7.819	1	9	3	8
PHILIPPINES	7	3.664	0.093	0.558	0.037	0.001	5.228	0.286	7.085	0	10	1	7
PORTUGAL	3	4.132	0.064	0.315	0.222	0.004	11.035	0.319	9.364	1	8	3	9

SINGAPORE	9	3.943	0.080	0.514	0.066	0.004	7.712	0.290	10.226	0	12	1	8
SOUTH AFRICA	8	3.361	0.097	0.682	0.035	0.001	8.969	0.222	8.134	1	8	4	8
SPAIN	7	3.728	0.066	0.567	0.007	0.003	9.468	0.197	9.647	1	8	4	7
SRI LANKA	10	3.220	0.121	0.626	0.021	0.000	2.516	0.191	6.938	0	8	0	7
SWEDEN	7	3.409	0.097	0.396	0.005	0.000	3.990	0.106	10.331	1	8	3	9
SWITZERLAND	6	2.880	0.075	0.595	0.010	0.001	8.822	0.221	10.496	1	8	3	5
TAIWAN	6	2.533	0.111	0.689	0.051	0.004	6.676	0.137	.	0	8	2	12
THAILAND	10	1.729	0.128	0.495	0.036	0.000	5.874	0.099	7.753	1	8.5	4	9
UK	7	4.108	0.075	0.422	0.002	0.000	9.239	0.044	10.226	1	8	3	5
US	116	3.763	0.074	0.656	0.029	0.012	10.035	0.093	10.516	1	8	4	12