Equity and Debt Governance: The Impact on Bank Risk *

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Abstract

How does discipline created in equity and debt markets affect bank risk? This study provides empirical evidence for 188 publicly listed banks from the United States and the Euro area during the period 2002–2007. Equity governance, as measured by concentrated ownership, is positively linked to four market-based indicators of bank risk, but this relation reverses for blockholdings larger than 25%. Moreover, bank risk is higher under weak debt market discipline by providers of customer deposits, which suggests a negative relation to the strength of banks' debt governance. Joint analyses show that equity and debt governance complement each other, i.e. the positive impact of ownership concentration on bank risk is more pronounced in banks under strong debt governance by holders of risky debt. Econometrically, the panel data methodology used tackles both the problem of bank-specific fixed effects and the endogeneity of the ownership variable. These findings suggest that equity and debt governance represent important drivers of bank risk, and their consequences should be considered by supervisors, investors, and the bank management.

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1. Introduction

The financial crisis of 2007–2008 has aroused public interest in the question whether financial institutions are properly governed. "Corporate governance deals with the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment" (Shleifer and Vishny, 1997), and from a principal–agent perspective, the providers of equity and debt capital have the right and the obligation to monitor, incentivize, and discipline bank managers. However, the corporate governance of banks interacts with at least two additional players: Firstly, insured depositors provide debt financing with usually short maturity, but they do not face a strong incentive to screen banks or to monitor the employment of capital. Secondly, with the enormous extent of public subsidies to the financial sector, and numerous governmental bail-outs of distressed banks world-wide, taxpayers can now be counted among banks' suppliers of finance as well. Theoretically, the interests of these two groups are to be protected by regulatory rules, and they are to be pursued by supervisory institutions.

The existing governance framework failed to prevent the banking crisis, though. Policymakers deciding about which new governance mechanisms to implement (e.g. stricter regulation, more diligent supervision, improved risk management, restrictions on executive pay etc.) need to consider the incentives of other capital providers, both equity and (risky) debt, to influence the solution of the agency problem in their own interest. Therefore, the following main questions are addressed in this study:

1. *How does concentrated ownership or the existence of a dominant blockholder (equity governance) influence bank risk?*
2. *What is the impact of risky debt compared to customer deposits as a bank funding source (debt governance)?*
3. *How do equity and debt governance interact in their joint determination of bank risk?*

The financial services industry is heavily regulated, and since regulatory rules differ word-wide, analyzing governance mechanisms in an international cross-section of banks is a challenging task. A recent contribution by Laeven and Levine (2009) shows how the interplay of the legal and regulatory environment and equity governance of banks translates into bank risk

taking. In contrast to that multi-national analysis, this study focuses on the role of equity and debt governance under relatively homogeneous regulatory and legal conditions, analyzing a comprehensive panel of exchange-listed banks in the United States and in the Euro area during the pre-crisis period 2002–2007.

One motivation for restricting the analyses to large, industrial economies is the more direct comparison of governance mechanisms *within* these countries, which represents the focus of this paper. Another advantage of this sample is that its panel structure allows to control for unobserved bank-specific fixed effects and hence to reduce the prevalent endogeneity problem, which has rarely been possible in previous studies on bank governance. Finally, and most importantly, while other papers study the impact of equity ownership and debt structure on bank risk separately, this paper provides a joint and comparative analysis of these governance factors.

Regarding equity governance, this study documents an inversely U-shaped relation between ownership concentration and bank risk: While block shareholdings up to an ownership stake of about 25% are positively linked to risk, the opposite holds for larger stakes. Regarding debt governance, which is measured with banks' liability structure (risky debt vs. deposits), it turns out that the more a bank relatively relies on deposits, the higher is its risk. Joint analyses indicate that the connection between ownership concentration and bank risk is more pronounced in banks under strong debt governance.

Hence, the contribution of this paper to the literature on bank governance and bank risk taking is fourfold: First, it is the first large-scale analysis that considers the interaction of equity governance by shareholders and debt governance by depositors jointly. Second, the empirical models applied are more flexible than in related studies in that they document non-linearities in the relation of equity governance and bank risk. Third, the large panel data set used, together with the empirical methodology applied, account for the prevalent endogeneity of governance variables, for bank-level fixed effects, and allow for an analysis of the causal relation between bank governance and bank risk. And fourth, this study uses a variety of market-based risk measures, including systematic risk, idiosyncratic risk, default risk, and losses during the financial crisis of 2008.

The remainder of this paper is structured as follows. Section 2 gives a review of the related literature and presents the set of hypotheses to be tested. Section 3 contains a conceptual foundation of the empirical analyses and a description of the data used. In section 4, the empirical results are presented: Subsection 4.1 focuses on the relation between concentrated bank ownership (equity governance) and risk, subsection 4.2 reports findings regarding the impact of debt governance, and subsection 4.3 discusses results from a joint analysis of these factors, comparing their relative importance. In section 5, the previous findings are checked for robustness regarding alternative indicators of bank risk, equity governance, and debt governance, and finally, section 6 concludes.

2. Literature and Hypotheses

2.1. Equity Governance: Bank Ownership and Bank Risk

The issue of equity governance by large shareholders has been studied by many scholars. Berle and Means (1932) are the first to argue that dispersed ownership exacerbates the agency conflict between owners and managers, as it reduces their effective influence on firm control. Shleifer and Vishny (1986) provide a theoretical model that emphasizes the monitoring rule of large blockholders. Both perspectives imply that concentrated ownership leads to better incentive alignment between shareholders and managers.

In their seminal contribution that lays the foundation of modern agency theory, Jensen and Meckling (1976) already acknowledge that the owner–manager conflict affects firm risk. Demsetz and Lehn (1985) as well as Kane (1985, p. 115) examine the relation of concentrated ownership and corporate risk taking in more detail. The argument is that much of managers' human capital is involved with the firm they work in. As they cannot fully diversify these idiosyncratic "career" risks with their limited private wealth, it is likely that these executives favor less risk taking than outsiders, including outside shareholders.[1] Equity governance by the disciplining function of large shareholders should help to alleviate this owner-manager conflict and thereby increase bank risk, so that I set up the following hypothesis:

[1] Managerial shareholdings—an otherwise appropriate method of incentive alignment—*cannot* solve this agency problem, as the concentration of managers' wealth within their employer's company is then even higher.

Hypothesis 1. *Compared to otherwise similar widely-held institutions, banks with a concentrated equity structure exhibit higher risk.*

However, it is important to note that the concept of well-diversified shareholders versus imperfectly-diversified executives is not valid for bank shareholders who have a significant part of their wealth invested in the company. This gives rise to the following supposition for large shareholdings above a certain threshold:

Hypothesis 2. *The positive impact of ownership concentration on bank risk diminishes and possibly reverses for high ownership stakes above a certain level.*

To sum up, the hypotheses suggest an inversely U-shaped relation of ownership concentration and risk: While the positive incentive-alignment effect dominates up to a certain level, very large shareholdings reduce or even turn back this relation, so that we expect a concave impact of the largest owner's share on bank risk.

There is the following empirical evidence on the relation between bank ownership and risk.

A first strand of the empirical literature analyzes the interaction of ownership structure, banks' regulatory environment, and risk taking. Most prominently, Laeven and Levine (2009) put together a data set of 270 banks from 48 countries world-wide. They find that more powerful bank shareholders (through higher ownership concentration or weaker regulation) go along with more risk taking, which they measure with Roy's (1952) z-score. It should be noted that relying on this accounting-based risk measure instead of market data, on which this study is based, may generally be problematic in Laeven and Levine's (2009) rather heterogeneous cross-country sample, but their evidence is clearly in line with Hypothesis 1. The authors also control for the endogeneity of large blockholdings using a two-stage regression procedure, but as they focus on the cross-section of banks under different regulatory regimes, they do not consider bank-specific fixed effects.

Using balance sheet data of 500 commercial banks from more than 50 countries (2005–2007), Shehzad et al. (2010) find that blockholdings between 10% and 25% increase banks' non-performing loans ratios, whereas the contrary is found for owners controlling more than 50% of a bank. Hence, both Hypothesis 1 and Hypothesis 2 are supported by their evidence. These

results are more pronounced if the levels of shareholder protection rights and supervisory control are low.

Kim et al. (2007) analyze the determinants of Japanese banks' ownership under different regulatory regimes during 1983–1991. Only for the least restrictive regulatory environment (1986–1988), they observe a significantly positive relation of stock return volatility and ownership concentration (which is their dependent variable).

Secondly, some empirical studies look at the equity governance of banks without focusing on its interaction with the regulatory environment. Generally, they provide quite strong support for a positive relation of ownership concentration and risk, as stated by Hypothesis 1, but possible opposite effects for a high degree of ownership concentration could barely be observed.

Saunders et al. (1990) analyze panel data comprising 38 bank holding companies in the years 1978–1985, of which they identify stockholder-controlled banks by the proportion of ownership rights held by bank managers. These banks exhibit higher stock return volatility, which is mainly driven by nonsystematic risk. Furthermore, the effect is strongest during the 1979–1982 period of deregulation.

Haw et al. (2010) study the risk of 325 banks from 9 Asian and 13 European countries during 1990–1996, and they show that concentrated control coincides with greater stock return volatility and higher insolvency risk. However, the positive effect regarding volatility holds only for family ownership, and the higher insolvency risk is primarily driven by government ownership. Another caveat is that the country-level random effects regression model they use cannot capture bank-specific fixed effects.

Magalhaes et al. (2008) analyze 423 banks during the period 2000–2006, and they control for the endogeneity of ownership concentration using a GMM dynamic panel data model. Unfortunately, they do not find a linear, quadratic, or cubic relation of ownership concentration and the volatility of book earnings or Roy's (1952) z-score, which might be due to the heterogeneity of regulatory environments in the 39 countries they consider.

Contradicting the studies yet presented, Barry et al. (2011) identify in a cross-section of 249 European banks that the existence of families or institutional investors acting as blockholders is negatively related to accounting-based measures of bank risk. The authors explain the fact

that this finding is limited to non-listed banks with the disciplining role of the stock market, acting as a substitute for monitoring by large shareholders. Another interpretation would be that the observed negative relation of concentrated ownership and bank risk is in fact due to the risk limitation by very large blockholders (like families or institutions).

To sum up, the evidence on the relation between ownership concentration and bank risk is ambiguous. While the majority of studies indicates a positive link, this result may be restricted to certain regulatory settings or ownership types, and even the contrary finding is observed, which may potentially indicate a non-linear relation. This study aims to contribute to this empirical literature by providing more robust evidence from large, industrial economies. The market-based measures of bank risk used should not be biased by accounting standards which differ world-wide. Furthermore, the rich panel data used allow to control both for bank-specific fixed effects as well as for the potential endogeneity of the ownership variable, which has only rarely been feasible in previous studies.

2.2. Debt Governance: Deposit Taking and Bank Risk

In contrast to the voting and control rights of shareholders, many of creditors' opportunities to exert direct influence on debtors are limited to the case of default: For example, they can pull collateral, exercise priority covenants, and sue managers for possible breach of duty. Apart from that, covenants allow for information acquisition about the firm's financial situation or for restricting debtors' capital structure, e.g. the equity-to-total assets ratio.

In the non-default state however, the most important instrument of debt governance is setting contract terms, in particular the (risk-adjusted) yield, seniority, maturity, and collateralization of debt. Most banks carry out debt financing using at least two fundamentally distinct categories: Customer deposits and other liabilities. While customer deposits benefit from deposit insurance (although, depending on the insurance scheme, they need not be 100% insured), other liabilities usually bear default risk, and I subsequently refer to them as "risky debt".

When it comes to the intensity of debt governance (debt market discipline), customer deposits and risky debt differ regarding four major aspects (e.g. Garten, 1986): First, reliable and high-quality *information* is essential for evaluating the quality and risk of debtors. While providers

of risky debt may gather private information, for example from financial covenants or from communication with bank executives, most depositors have only access to public information (financial statements or press reports), which creates an informational disadvantage for them. Second, many depositors do not have adequate *skills and expertise* to evaluate the information available, whereas other creditors, in particular institutions, are often more competent and experienced. Third, deposit insurance reduces the *incentive* of depositors to exercise market discipline. As repayment is secured by the deposit insurer or by the government, depositors are likely to make less of an effort than risky creditors who possibly have to bear the losses of a bank insolvency (default risk). Finally, the possibilities to exert *influence* are less pronounced for small depositors. Each of them can withdraw his deposits, but as long as this happens on an individual basis and does not cause a "bank run", the marginal impact on bank management remains small. Also, bargaining about deposit rates or other contract terms is hardly imaginable for depositors. On the other hand, providers of risky debt demand a risk-adjusted yield and impose thus pressure on executives to limit bank risk. Other ways to exert influence for them are affirmative covenants or the threat to withdraw large credits. To sum up, all four dimensions indicate that the intensity of debt governance exercised by insured depositors is smaller than by other creditors, which motivates the following hypothesis:

Hypothesis 3. *The mitigation of risk due to debt market discipline is less pronounced in banks whose funding relies strongly on customer deposits.*

Notice that it would be incorrect to argue that there is *no* market discipline by depositors. Most prominently, Park and Peristiani (1998) as well as Martinez Peria and Schmukler (2001) empirically show that even if their money is insured, depositors discipline banks by withdrawing deposits and requesting higher interest rates. Rather, Hypothesis 3 claims that providers of risky debt get *more* involved in debt governance, and consequently, the ratio of a bank's customer deposits to total liabilities serves in the empirical analysis as an indicator of less intense debt governance.

Furthermore, deposit insurance funds are supposed to act on behalf of insured depositors. They provide incentives to reduce bank risk by setting risk-adjusted premiums, and they take

a monitoring role by conducting regular as well as situational examinations of banks. Both activities have a risk-reducing effect on depository institutions.

It should also be noted that there are two faces of debt market discipline: monitoring and influence (Flannery, 2001). Market *monitoring* asks whether the price of debt is sensitive to bank risk, which has been first documented by Flannery and Sorescu (1996) for subordinated debenture yields. However, from a debt governance perspective, it is more important whether this risk-pricing also *influences* bank management so as to prevent excessive risk taking.

Bliss and Flannery (2002) are the first to analyze the direct influence of bondholders on bank managers. They argue that shareholders and creditors share the same interest in improving the firm's profitability, but they have diverging interests regarding risk. While shareholders benefit from increased risk through the option character of equity (Merton, 1974), and the option value of deposit insurance (Merton, 1977), this risk shift is on the cost of risky bondholders. Despite this conflict, Bliss and Flannery (2002) observe a positive co-movement of large U.S. bank holding companies' stock and bond prices during the period 1986-1997, indicating that interests of these groups are more aligned than one might expect. However, the authors admit that the other evidence they provide is so ambiguous and partly inconsistent that it remains unclear whether bondholders' influence is beneficial or perverse.

Gropp and Vesala (2004) provide a theoretical model to show that explicit deposit insurance may reduce moral hazard in banks, if it credibly commits that non-deposit creditors have to bear the default risk and do not benefit from a further implicit guaranty. Empirically, they analyze 128 European banks during 1991–1998 and confirm their prediction in cross-sectional and time-series analyses. This result can mainly be attributed to the disciplining function of risky debtholders. Furthermore, Gropp and Vesala (2004) find that the introduction of explicit deposit insurance may have induced banks to shift their liabilities towards more insured deposits.

Apart from corporate governance considerations, there is also recent evidence on banks' choice between deposit taking and (non-deposit) wholesale funding. Based on an analysis of international banks in the period 1995–2007, Demirgüç-Kunt and Huizinga (2009) report for most banks a relatively low share of non-deposit funding (mean of 8.1%). Further increases in this value lead to a risk reduction due to diversification (Roy's (1952) z-score or the distance-

to-default), but an exclusive reliance on wholesale funding would again imply high bank fragility.

To sum up, the literature suggests that market discipline exerted by risky bondholders may discipline bank managers and thus mitigate bank risk, which is in line with Hypothesis 3. However, this means that the forces of equity and debt governance collide in terms of bank risk, which underlines the need for a joint analysis of these drivers, which is perform at the end of section 4. Besides its reliance on market-based indicators of bank risk, and its careful control for heterogeneity in the cross-section (using bank-level fixed effects) as well as endogeneity (using a two-step GMM methodology), this is the major contribution of the present paper.

3. Conceptual Framework and Data Used

3.1. Measures of Bank Risk

Bank risk has various facets, such as income fluctuations and return risk for shareholders or creditors, solvency and liquidity risk, or credit risk of the loans granted by the bank. As this study adopts a corporate governance perspective, its focus is on the first two of these categories. The indicators for bank risk used by rating agencies, supervisors, and researchers can be classified into accounting-based measures (e.g. the non-performing loans ratio or Roy's (1952) z-score), soft facts (e.g. management quality), and market-based measures (e.g. the credit spread of bank debt, the equity return volatility, or Merton's (1974) distance-to-default). While *CAMEL*-ratings which are widely used in bank supervision combine the first two classes, it may be problematic that the results from an international data set could be biased by differing accounting rules, or "earnings management" by bank executives. Therefore, this analysis relies on market-based indicators, which should also exhibit a more prompt reaction on risk shifts, provided that markets are efficient. Flannery (1998) surveys the literature on market information about bank risk and proposes that it should be used more extensively, both in public supervision and in private governance services by investors and analysts.

Daily returns of bank stock stemming from *CRSP* (U.S.) and *Datastream* (Europe) build the starting point of the subsequent analyses. For each of the six years during the period 2002–2007,

the sample contains all banks which are listed in the *Dow Jones U.S. Banks Index* or in the *Dow Jones EURO STOXX Total Market Index Banks* during the entire year.

As a measure of *total risk*, we calculate the standard deviation of bank i's daily stock returns $r_{i,\theta}$ on the trading day θ in each of the six calendar years t:

$$TOTVOLA_{i,t} = \sigma_{i,t} = \sqrt{\frac{1}{251}\sum_{\theta \in t}(r_{i,\theta} - \overline{r}_{i,t})^2}. \tag{1}$$

To differentiate between its market-specific and its firm-specific (idiosyncratic) fraction, it is useful to decompose the variance of stock returns into these parts. Estimates of market risk and idiosyncratic volatility are calculated using the single-index market model (2) with respect to the daily bank index returns $r_{m,\theta}$ in each year t provided by *Dow Jones* for the U.S. or European market:

$$r_{i,\theta} = \alpha_{i,t} + \beta_{i,t} r_{m,\theta} + \epsilon_{i,\theta} \quad \forall\, \theta \in t \tag{2}$$

$$MKTRISK_{i,t} = \beta_{i,t} = \frac{\mathrm{Cov}(r_{i,t}, r_{m,t})}{\mathrm{Var}(r_{m,t})} \tag{3}$$

$$IDIVOLA_{i,t} = \sqrt{\sigma^2_{\epsilon i,t}} = \sqrt{\sigma^2_{i,t} - \beta^2_{i,t}\sigma^2_{m,t}} \tag{4}$$

This methodological setup is similar to that used by Anderson and Fraser (2000), and it applies a single-index model rather than a two-index model that incorporates also interest rates (see e.g. Saunders et al., 1990), because the focus is on the sensitivity regarding equity market changes, and because the average effect of interest rate fluctuations is captured by the sector-specific indices. Furthermore, all subsequent analyses include annual dummy variables which control for interest levels.

Downside risk measures are of particular importance for banking supervisors who aim to assure financial stability, and for rating agencies or bank creditors who are primarily interested in default risk. Besides the Value-at-Risk concept, the approach most frequently used is the distance-to-default, which is promoted by *Moody's KMV* and relies on the credit risk model introduced by Merton (1974). In this study, the latter approach is preferred to other market-based measures like spreads of (subordinated) bank debt or credit default swaps because these

securities have not been issued by the total universe of banks under consideration (subordinated debt), or lack sufficiently liquid trading (bonds), or do not publicly disclose comprehensive price data (CDS spreads). Empirically, the predictive ability of the distance-to-default regarding bank fragility is shown e.g. by Gropp et al. (2006).

In a nutshell, the distance-to-default indicates by how many standard deviations the value of assets exceeds the value of debt. Thus, the lower the distance-to-default, the more risky is a bank. Bharath and Shumway (2008) appreciate the contribution of Merton's distance-to-default model, and they provide also a straightforward presentation of its setup and assumptions:

The development of total firm value V over time t is modeled with a geometric Brownian motion, depending on its expected continuously compounded return μ and its volatility σ_V:

$$dV = \mu V dt + \sigma_V V dW, \tag{5}$$

where dW is a standard Wiener process. If we further assume that the firm has issued just one zero-coupon bond with face value F maturing in T periods, the equity of the firm can be interpreted as a call option on V with strike price F. Using the Black-Scholes-Merton formula, it am then possible to express the value of equity E as follows:

$$\begin{aligned} E &= V\mathcal{N}(d_1) - e^{-rT}F\mathcal{N}(d_2), \\ \text{where} \quad d_1 &= \frac{\ln(V/F) + (r + 0.5\sigma_V^2)T}{\sigma_V\sqrt{T}} \quad \text{and} \quad d_2 = d_1 - \sigma_V\sqrt{T}, \end{aligned} \tag{6}$$

with r being the risk-free rate and $\mathcal{N}$ the cumulative standard normal distribution function. Furthermore, under Merton's (1974) assumptions it can be shown using Itō's lemma that

$$\sigma_E = \left(\frac{V}{E}\right)\frac{\partial E}{\partial V}\sigma_V = \left(\frac{V}{E}\right)\mathcal{N}(d_1)\sigma_V. \tag{7}$$

Notice that in contrast to most applications of the Black-Scholes-Merton formula, the value of the underlying asset V as well as its volatility σ_V are not observable and must be inferred, while the market price of equity E and its volatility σ_E can be taken from stock market data.

The analyses apply $\sigma_E = \sqrt{252} \cdot TOTVOLA_{i,t}$, and E represents the market capitalization (stock price times shares outstanding) at each year-end. Furthermore, the forecasting horizon is parameterized as $T = 1$ year, and the asset drift rate μ is taken from the year-specific risk-free rate r_t.[2] Consistently with the *KMV* rating methodology, F—the face value of debt—is approximated by total liabilities minus one-half of long-term debt.[3]

The following adjustment incorporates the value of deposit insurance. Merton (1977) shows that, compared to default-risky debt, bank financing via insured deposits creates a put option on the market value of bank assets with a strike price equal to the amount of deposits taken. Intuitively, insured depositors will always be able to cash their deposits at their nominal value, so that a bank faces risk-free funding and does not have to pay a risk-adjusted deposit rate. If we assume—to simplicity matters—that banks do not pay dividends, the value of the put option can be calculated according to Ronn and Verma (1986) as

$$Dep \cdot \left[\mathcal{N}\left(\frac{\ln(D/V) - 0.5\sigma_V^2}{\sigma_V} + \sigma_V \right) - \frac{V}{D} \cdot \mathcal{N}\left(\frac{\ln(D/V) - 0.5\sigma_V^2}{\sigma_V} \right) \right], \tag{8}$$

where Dep is the amount of total customer deposits, and the other variables are as defined above.

This option premium is added to the firm value V, and simultaneously solving equations (6) and (7) yields numerical values of V and σ_V for each bank i in every year t. Thus,

$$DISTDEF_{i,t} = \frac{\ln(V/F) + (\mu - 0.5\sigma_V^2)T}{\sigma_V \sqrt{T}} \tag{9}$$

is the distance-to-default, and the corresponding probability of default (also called expected default frequency) can be calculated from $EDF_{i,t} = \mathcal{N}(-DISTDEF_{i,t})$. However, the subsequent analyses focus primarily on negative distance-to-default ($-DISTDEF_{i,t}$) which has the advantages that it is (unlike the $EDF_{i,t}$) approximately normally distributed, and that it exhibits (due to its negative scaling) a positive correlation to the other risk measures.

[2] This assumption is in line with e.g. Gropp et al. (2006) since with our relatively short time series, it is not feasible to obtain valid estimates of the implied expected asset drift rate μ from the Merton (1974) model.

[3] As explained by Vassalou and Xing (2004), this arbitrary approximation accounts for interest payments to long-term creditors and the bank's ability to roll over its short-term debt.

Insert Table 1 here

Panel A of Table 1 presents correlation coefficients for these four risk measures. It is striking that, despite their very different concepts, all pairwise combinations (except $MKTRISK$ and $IDIVOLA$) exhibit a high and significant correlation. The analyses in section 4 investigate if and compare how strong equity and debt governance influence each of these risk measures.

3.2. Description of the Data

The analyses cover publicly listed banks from the U.S. and the Euro area on an annual basis between 2002 and 2007, considering all banks which are listed in one of two stock indices during an entire calendar year, in the *Dow Jones U.S. Banks Index* or in the *Dow Jones EURO STOXX Total Market Index Banks*. These indices comprehend "banks providing a broad range of financial services, including retail banking, loans and money transactions", of which *Dow Jones* claims that they cover 95 percent of the free float market capitalization. Besides the use of market-based measures for risk and performance, constraining the sample to these banks helps to ensure an efficient market for corporate control, where equity market discipline should be more pronounced than in non-listed companies, which are consequently excluded from this study.

For these banks and every year, information about the three largest owners are hand-collected from proxy filings to the SEC, or from annual reports, which yields 971 bank-year observations. 27 observations have to be dropped when these data are merged with stock market information stemming from *CRSP* (U.S.) or *Datastream* (Europe), and with accounting information from *Compustat* because of lacking data in one of the additional resources. 11 more 'irregular' observations are excluded, for example for the investment bank *Lazard* which had a negative book equity after their going public, so that the final sample covers 933 observations from 188 banks. The 127 American and 61 European banks included are listed in the appendix. Notice that this is an unbalanced panel data set with some banks entering or dropping out during the sample period, but we observe the full set of 6 observations for 115 banks (61%).

Panel B of Table 1 reports summary statistics. The primary measure of equity governance is the largest owner's beneficial ownership share ($SHARE1_{i,t}$) of bank i in the year t. As

corporate governance theory suggests, large blockholders face stronger incentives to monitor and discipline managers so that the agency problem could be alleviated in favor of shareholders. Generally, SEC filings and annual financial statements report ownership stakes larger than 5%, so that we obtain 614 observations with at least one owner exceeding this threshold. The mean (median) value of $SHARE1_{i,t}$ for these banks is 17.8% (9.5%), with the most powerful owner holding 95.0% of voting rights. All other banks disclose that there is no owner holding more than 5%, and since shareholders may hold ownership stakes just below this reporting threshold in order to remain anonymous, the most conservative method is to winsorize the value of the largest owner at $SHARE1_{i,t} = 4.99\%$, which has been done. The variable $SHARE3_{i,t}$ is defined accordingly, but it includes also the stakes of the second and third largest shareholders, if available. It is used for robustness checks.

Debt governance deals with the methods employed by outside creditors to enforce their interests. Deposit insurance makes the incentives to get involved with debt governance much less pronounced for depositors, and hence debt governance is measured with the amount of customer deposits over total liabilities ($DEPLIAB_{i,t}$). Notice that this measure does not technically depend on the choice between equity and debt financing. With a mean of 64.9% and values between zero and 99%, significant variation in this variable can be observed. The ratio of long-term debt over total liabilities as an alternative measure of debt governance is used for robustness checks.

The definition and interpretation of the indicators for bank risk has been discussed in subsection 3.1. As Table 1 reports, the annualized stock return volatility ($TOTVOLA_{i,t}$) is on average 25.0%, of which the idiosyncratic component ($IDIVOLA_{i,t}$) amounts on average to 18.9%. The remainder is due to market risk ($MKTRISK_{i,t}$), which is measured with the beta factor relative to the respective banks index. $MKTRISK_{i,t}$ exhibits a mean value of 0.89 and ranges between –0.03 and 1.74. The negative distance-to-default ($-DISTDEF_{i,t}$) is already scaled inversely so that a larger value indicates *higher* default risk and vice versa. In the sample used, the firm value of one bank (*Fremont Gen. Corp.*) exceeds the value of liabilities by just 1.46 standard deviations, while $-DISTDEF_{i,t}$ has a mean value of -4.94 and a minimum of -16.41.

Finally, all multivariate analyses contain the following control variables for each bank's charter value, size, and capitalization. Firstly, as hypothesized by Keeley (1990), valuable bank charters may set risk-reducing incentives to bank managers. To measure of banks' charter value, the firm value V from the Merton (1974) model is scaled with the book value of total assets, and the resulting variable $FIRMVAL_{i,t}$ exhibits a mean of 0.98.[4] Secondly, with total book assets between 700 million and 2.2 trillion US-Dollars, bank size in this sample differs a lot, and it may influence bank risk, for example through better diversification in larger banks. Given the skewed distribution of this variable, the analyses include the natural logarithm of total bank assets ($LOGASSET_{i,t}$) as a measure of bank size. Thirdly, the ratio of book equity to total book assets ($EQASSET_{i,t}$, on average 8.0%) accounts for bank solvency, which may through the leverage effect of debt vs. equity financing, so that $LOGASSET_{i,t}$ and $EQASSET_{i,t}$ are included in all of the following multivariate analyses.

4. Empirical Analysis

4.1. Bank Ownership and Bank Risk

The analyses in this subsection investigate how ownership concentration, as a measure for the intensity of equity governance, is related to bank risk indicators. As discussed in section 2, Hypotheses 1 and 2 predict that banks with a concentrated equity structure exhibit higher risk, but also a diminution or even a reversion of this effect for high ownership stakes above a certain level.

The regressions build upon the following model:

$$\begin{aligned} RISK_{i,t} = &\alpha + \beta\, EQGOV_{i,t} + \gamma_1\, FIRMVAL_{i,t} + \gamma_2\, LOGASSET_{i,t} \\ &+ \gamma_3\, EQASSET_{i,t} + \delta_{t*US} + \delta_i + \epsilon_{i,t}. \end{aligned} \tag{10}$$

As dependent variable $RISK_{i,t}$ serves alternatively the stock return volatility ($TOTVOLA_{i,t}$), the beta factor with respect to the banking market calculated from a single-index model

[4] The lower values for $FIRMVAL_{i,t}$ are due to the default risk of bank debt (except deposits), and the partial deduction of long-term liabilities, which reduces the market value of debt below its face value.

($MKTRISK_{i,t}$), the idiosyncratic volatility ($IDIVOLA_{i,t}$), or the negative distance-to-default from a Merton (1974) model ($-DISTDEF_{i,t}$). Surely, risk is expected to be clustered on the bank level, which would be reflected in the bank-level fixed effect variable δ_i.[5] However, the definition of $RISK_{i,t}$ is bank-year-specific, and does not technically imply a serial correlation, so that its lagged value $RISK_{i,t-1}$ need not be included as independent variable into the baseline regression model (10).[6] Besides the maximization of sample size, this prevents econometric problems due to the dynamic panel bias (Nickell, 1981).

Equity governance, as measured by the largest owner's share, represents the main explanatory variable. Its first specification $EQGOV_{i,t} = SHARE1_{i,t}$ assumes a linear relation between ownership concentration and equity governance intensity. Regression coefficients indicate a negative link between the largest owner's share and bank risk, but are subject to relatively high standard errors, so that coefficients lack statistical significance (results are not tabulated for brevity). Therefore, the second specification of $EQGOV_{i,t}$ incorporates possible non-linearities between ownership concentration and the strength of equity governance, and assumes the quadratic relation $\beta\, EQGOV_{i,t} = \beta_1\, SHARE1_{i,t} + \beta_2\, (SHARE1_{i,t})^2$.

As bank-year-specific control variable, $FIRMVAL_{i,t}$ is included to account for banks' charter value which may be negatively related to bank risk (Keeley, 1990). Besides, large banks can reduce their non-systematic risk through diversification, but a bank which is "too big to fail" may also capitalize on public support by increasing risk, so that the empirical model controls for bank size with the natural logarithm of total bank assets ($LOGASSET_{i,t}$). The model contains also the equity-to-total assets ratio ($EQASSET_{i,t}$) as a measure of capital structure and as an indicator of solvency. A full set of interacted US*year dummies (δ_{t*US}) as well as bank-level fixed effects (δ_i) are also included.

Insert Table 2 here

[5] Zhou (2001) questions the suitability of fixed effects estimators in studies on managerial ownership. He shows that the ownership variable exhibits little changes over time so that the within-firms estimator may not detect a de facto existing effect. In this study, however, the values of $EQGOV_{i,t}$ are not entirely stable, and the regression models *do* provide consistent results so that the Zhou (2001) critique can be subordinated under the advantages of using bank-level fixed effects.

[6] Breitung (2000) tests reject the null that the panel contains unit roots for all four specifications of $RISK_{i,t}$.

4.1.1. Empirical Findings from Fixed-Effects Least-Squares Regressions

In Panel A of Table 2, columns (1)–(4) report regression results for all four risk measures. Strikingly, we observe a significant non-monotonic link between the largest owner's share and bank risk: While coefficients for the linear term ($SHARE1_{i,t}$) indicate higher risk in all four models, the opposite holds for the quadratic term $(SHARE1_{i,t})^2$. Most importantly and in accord with Hypothesis 1, this finding indicates a positive relation of the intensity of equity governance and bank risk, as was our expectation based on theory and prior evidence. Furthermore, the significantly negative coefficient β_2 indicates that this link is reduced or even inverted if ownership concentration becomes large, which is also in line with Hypothesis 2. To study the non-linear link more specifically, the contribution of equity governance to the four risk indicators is displayed in Panel B of Table 2.

Total volatility, market risk, and idiosyncratic volatility are scaled on the left axis whereas the negative distance-to-default is scaled on the right axis. Obviously, in a range between 5% and 25%, the largest owner's share is positively associated with bank risk, but then the relation becomes weaker and even reverses for larger ownership stakes.[7] A possible explanation may be the entrenchment argument by Gorton and Rosen (1995), who theoretically predict and empirically validate an inversely U-shaped pattern between shareholdings of bank insiders and riskier loan granting. The authors explain this finding with corporate control problems that facilitate excessive risk taking if entrenched bank managers enjoy private benefits of control, which they presume for insider holdings between 4% and 40%.

The evidence by Gorton and Rosen (1995) is limited to an "unhealthy state" of the banking industry, like in the U.S. of the 1980s, and their theory and empirical conclusions focus on managerial shareholdings, whereas the data used in this study do not allow to distinguish between inside and outside bank ownership.[8] But in a sense, Gorton and Rosen's (1995) reasoning can still be adopted to the present findings, as large shareholders often undertake

[7]The aggregate linear and quadratic term of the largest owner's share is at the margin significantly positively related to $TOTVOLA$ for values of $SHARE1$ in the range $[5\%, 25\%]$, to $BETA$ in $[5\%, 11\%]$, to $IDIVOLA$ in $[5\%, 23\%]$, and to $-DISTDEF$ in $[5\%, 13\%]$ (significance at least at the 5%-level). Significantly negative relations are obtained if the largest owner's shares exceed 40–50%.

[8]I have information about the number of shares held by officers and directors only for my sub-sample of U.S. banks. These data are used as one of my robustness checks in section 5.

the task of working in the board of directors and thus exert influence on bank management. Blockholders may hold their shares because they also enjoy private benefits from high risk taking in a range between 5% and 25%. But for larger ownership stakes, a drawback of this entrenchment is the concentration of private wealth within the bank. The lack of opportunities to fully diversify the idiosyncratic risk, or simply risk-averse behavior, may induce large owners to use their power of limiting or reducing bank risk, which the graph shows for ownership stakes larger than 40–50%.

The link which we observe between concentrated ownership and bank risk is not only statistically significant, but also economically relevant. The coefficients imply that a bank with a 25% blockholder exhibits a 6% higher total volatility, a 4% higher idiosyncratic volatility, a beta factor that is larger by 0.12, or a firm value which is 0.7 standard deviations closer to the default threshold. Notice that the control variables for size and capitalization do not show statistical significance because much of the cross-sectional variation is captured by the bank-level fixed effects. In contrast, the (unreported) interacted US*year dummy variables, which control for the respective macroeconomic situation in general and the stock market in particular, are highly significant. Also, within-banks R^2 values between 0.3 and 0.6 show that the explanatory power of my models is relatively high.

To further investigate the ownership–risk relation, a cubic model for $EQGOV_{i,t}$ is estimated as well, but the results do not improve any more. Regression coefficients are not reported here. But possibly, the relation between ownership concentration and bank risk is not adequately represented by a polynomial function. To address this concern, the regression models presented in Table 3 estimate linear coefficients for $SHARE1_{i,t}$ separately in the ranges below and above 25%. Hence, to specify $EQGOV_{i,t}$, the variable $SHARE1_{i,t}$ is truncated at the 25%-level, i.e. all larger ownership stakes are set to the value of 25%. An additional explanatory variable, defined as $(SHARE1_{i,t} - 25\%)$, considers large blocks exceeding the 25% threshold, and takes the value of zero if ownership concentration is lower. As the regression results of models (1a) to (4a) show, the increase in risk for block size below 25% is statistically significant at least at the 5%-level, and the inverse effect holds at least at the 10% significance level.

4.1.2. Empirical Findings from Dynamic Two-Step *System GMM* Regressions

Compared to *OLS* regressions, which have been applied in many other studies, the fixed-effects models presented in the previous paragraphs already control for unobserved heterogeneity in the cross-section of banks and reduce doubts that significant control variables on the bank-level have been omitted. Nevertheless, there may be concerns that there exists a reverse causality from bank risk to governance.

Therefore, the regressions of bank risk on (piecewise defined) ownership concentration are re-estimated following a dynamic panel data methodology by including the first lag of the dependent variable as an additional regressor. The estimation follows the two-step *System GMM* methodology introduced by Blundell and Bond (1998) with Windmeijer's (2005) finite sample correction.[9] Lagged values from $(t-1)$ and earlier serve as instruments for the potentially endogenous governance variables as well as their interaction terms. Regression results are reported in models (1b) to (4b) of Table 3.

Roodman (2009a) points out that applying dynamic panel data regressions demands for diligent testing to ensure correct model specification and the validity of the instrument set. The specification tests for all models (1b) to (4b) show benign p-values: We do not face a second-order autoregressive process, and the (robust) Hansen test as well as Difference-Hansen tests do not reject the null hypothesis that instruments are valid. In these analyses, the sample size is reduced to 744 bank-year observations because we lose one observation for each bank when including the lagged dependent variable. But still, the number of instruments is relatively small so that the endogenously defined variables should not be overfit by too many instruments.

Confirming our previous findings, it turns out that for all four measures of bank risk, a significantly positive impact of the largest owner's share can be observed up to an ownership stake of about 25%. This positive relation reverses significantly for larger ownership stakes, which is in line with both Hypothesis 1 and Hypothesis 2. Thus, we can conclude from the GMM regressions that the inversely U-shaped relation of ownership concentration and risk is robust regarding endogeneity.

[9] Technically, Roodman's (2009b) "xtabond2" command for Stata is applied.

4.1.3. Equity Governance and the Financial Crisis of 2008

The market-based measures I analyzed so far are widely-accepted indicators for bank risk under "regular conditions". However, it is questionable whether concentrated bank ownership has also an inversely U-shaped relation to bank risks which arise in a systemic crisis. Flannery (2009) shows that conventional risk indicators like spreads of bank debt failed to predict bank failures due to losses in sub-prime lending. More specifically, Gropp and Köhler (2010) document that before the crisis, banks with high ownership concentration performed better, but during the crisis they suffered higher losses, meaning that their pre-crisis findings did prove true under "irregular" conditions. Therefore, the following paragraph checks whether my results also apply to those types of bank risk that translated into losses during the ongoing banking crisis.

I measure these losses by the stock performance of each individual bank in the year 2008, when the most severe losses were realized, which amounted on average to 63.9% in the U.S. and to 61.9% in Europe (Dow Jones Banks indices). My hypothesis is that bank ownership patterns in the last year before the beginning of the recent crisis (2006) relate to risk taking, which affects losses during the crisis (negative stock returns $LOSS2008_i$). Instead of assuming a quadratic or piecewise linear link as above, I apply the following two-step procedure: Firstly, $LOSS2008_i$ is regressed on the control variables $LOGASSET_{i,2006}$ and $EQASSET_{i,2006}$ and a dummy variable indicating U.S. banks. Bank size is significantly positively related to $LOSS2008_i$, whereas capitalization exhibits a negative impact (coefficients not reported here).

Insert Figure 1 here

Secondly, and more importantly, I analyze the residuals from this first-stage regression, which are displayed in Figure 1, conditional on ownership concentration in the year 2006 ($CF_{i,2006}$). This graph presents also mean values from a fractional polynomial as well as 95% confidence bands. The slope of the mean value function may seem flat for low values of $CF_{i,2006}$, but notice that the impact of concentrated bank ownership on crisis-related losses is at the 5%-level significantly positive if the largest owner holds a share between 15% and 30%.[10] This result, as well as the negative relation for high ownership concentration, corresponds to the

[10] I confirm the marginal significance of this relation for values of $CF_{i,2006}$ below and above 25% in a piecewise linear regression model.

findings regarding the other indicators of bank risk, and we can thus conclude that the inversely U-shaped relation detected above holds also true for losses due to the banking crisis of 2008.

4.2. Deposit Taking and Bank Risk

According to Hypothesis 2, I expect that the mitigation of risk due to debt market discipline is less pronounced in banks whose funding relies strongly on customer deposits. I use the following fixed effects regression model to analyze how the ratio of customer deposits to total liabilities, my measure of debt governance, interacts with bank risk taking:

$$RISK_{i,t} = \alpha + \beta\, DEPLIAB_{i,t} + \gamma_1\, LOGASSET_{i,t} + \gamma_2\, EQASSET_{i,t} + \delta_{t*US} + \delta_i + \epsilon_{i,t} \tag{11}$$

The dependent variable $RISK_{i,t}$ is one of my measures for bank risk ($TOTVOLA_{i,t}$, $MKTRISK_{i,t}$, $IDIVOLA_{i,t}$, or $-DISTDEF_{i,t}$). Debt governance intensity is measured with $DEPLIAB_{i,t}$, the ratio of total customer deposits to total liabilities. I acknowledge that not all customer deposits are insured[11], but the data do not disclose the precise amount of insured deposits. However, reduced incentives due to deposit insurance are only one of the four reasons presented above why market discipline by depositors is likely to be less pronounced. Please note the scaling of $DEPLIAB_{i,t}$: The *lower* this value, the *more* intensive is debt governance.

Control variables for bank size ($LOGASSET_{i,t}$) and capitalization ($EQASSET_{i,t}$), as well as a full set of interacted US*year dummies (δ_{t*US}) are also included in the model. Table 4 reports regression results.

Insert Table 4 here

The significantly positive coefficients for the deposits-to-total liabilities ratio in all models (1)–(4) confirm the negative relation of debt governance and bank risk which I expected in Hypothesis 3. Economically, this means that a bank which has 50% of its liabilities issued as risky debt exhibits a stock return volatility that is 9% lower and a beta factor that is lower by

[11] This is the case e.g. for deposits exceeding the $100,000 threshold in the U.S., or the €50,000 threshold in Europe. Voluntary deposit insurance funds increase these limits further.

0.2 than a bank which has only liabilities in form of customer deposits. Also, its idiosyncratic volatility is 9% lower, and its firm value is 1.7 standard deviations farther away from the default threshold. The statistical significance of all explicit control variables is low, which indicates that the bank-level fixed effects capture most of the cross-sectional variation, and that the interacted US*year dummy variables capture most of the time-series variation in my data. Notice also that all models perform well again in terms of explanatory power (within-banks R^2).

4.3. The Interplay of Equity and Debt Governance

I complete the empirical analyses with a comparative and joint investigation of equity and debt governance. As the preceding sections show, large shareholders and risky debtholders have differing interests regarding bank risk, so that we see a clash here of two governance forces. This motivates a joint investigation how equity and debt governance interact in terms of bank risk.

To my knowledge, only two other papers study the equity and debt governance of banks simultaneously on an individual-bank level. Schaeck et al. (2011) analyze forced turnovers of bank managers in U.S. banks. They find that shareholders are more likely to dismiss executives if debt market discipline is strong, either due to a high share of subordinated debt over total assets or due to a low share of core deposits. This implies that equity and debt governance complement one another. Forssbæck (2011) analyzes determinants of the relation between equity governance, the "safety net" (including deposit insurance) and bank risk taking. In a Jensen and Meckling (1976)–type theoretical set-up, he models insured deposits and risky debt separately. Higher managerial shareholdings should shift bank control towards shareholders' interests, and in Forssbæck's (2011) model, their direct effect boosts bank risk indeed. However, a simultaneous increase in leverage will reduce or even outweigh the positive direct effect, depending on the strength of market discipline by risky creditors and the amount of insured deposits. Empirically, Forssbæck (2011) finds in a sample of 334 banks in 47 countries a convex relation of inside ownership and risk, measured by Roy's (1952) z-score or the non-performing loans ratio. The measures of debt governance intensity are insignificant as stand-alone variables,

but their interaction with managerial shareholdings tempers the impact of equity governance, and thus reduces risk.

The following analysis contributes to this literature by investigating the interplay of equity and debt governance on bank risk. Do ownership concentration and the ratio of customer deposits to total liabilities interact as substitutes or complements?

My approach for the joint analysis of debt and equity governance relies very much on the empirical models used in the sections 4.1 and 4.2. I include the equity governance variables ($EQGOV_{i,t}$), and the ratio of customer deposits to total liabilities ($DEPLIAB_{i,t}$) in my regression model, to see whether the relations yet detected persist in a joint analysis. The interactions between equity and debt governance are studied as follows. Banks which strongly rely on deposit funding are defined as "deposit takers" ($DEPLIAB_{i,t} > 69.2\%$, median split) and marked by the indicator dummy variable $\mathbf{I}_{DEPLIAB_{i,t}>69.2\%}$.[12] The interaction terms of this dummy variable and my measures of equity governance tell us whether equity and debt governance complement or interfere with each other. I apply the following regression model for bank risk ($TOTVOLA$, $MKTRISK$, $IDIVOLA$ or $-DISTDEF$):

$$\begin{aligned} RISK_{i,t} = \alpha + \beta_1\, EQGOV_{i,t} + \beta_2\, DEPLIAB_{i,t} + \beta_3\, EQGOV_{i,t} * \mathbf{I}_{DEPLIAB_{i,t}>69.2\%} \\ + \gamma_1\, LOGASSET_{i,t} + \gamma_2\, EQASSET_{i,t} + \delta_{t*US} + \delta_i + \epsilon_{i,t}. \end{aligned} \tag{12}$$

Equity governance is measured by the linear and quadratic term of the largest owner's share: $\beta_1\, EQGOV_{i,t} = \beta_{1,1}\, SHARE1_{i,t} + \beta_{1,2}\, (SHARE1_{i,t})^2$. I include control variables as specified above and present fixed-effects regression results in Panel A of Table 5. Coefficients from Dynamic *System GMM* regressions (including $RISK_{i,t-1}$ as a regressor) are reported in Panel B of Table 5.

Insert Table 5 here

The coefficients for the largest owner's share and the deposits-to-total liabilities ratio are very similar in size to the estimates in separate models for equity and debt governance.[13] All of the

[12] Alternatively, I split my sample at the 25%-quantile ($DEPLIAB_{i,t} > 51.6\%$) or at the 75%-quantile ($DEPLIAB_{i,t} > 79.2\%$), and obtain the same findings regarding bank risk as reported in this section.

[13] The only exception is the insignificant coefficient for $DEPLIAB_{i,t}$ explaining $MKTRISK_{i,t}$.

previous results—the positive relation of small blockholdings to risk, the negative relation of shares above 25%, and the negative link of debt governance—are confirmed. Furthermore, the interaction terms for equity governance in banks which mainly rely on deposit funding reveal that the relation of ownership concentration and the idiosyncratic risk ($IDIVOLA_{i,t}$) or the negative distance-to-default ($-DISTDEF_{i,t}$) is more pronounced in banks under strong debt governance. In my models for total volatility and market risk, interaction terms are insignificant, but the illustration in Figure 2 shows that the overall impact of the linear and cubic term is always smaller for "deposit takers" with weaker debt governance (broken lines).

Insert Figure 2 here

The slopes of the curves for the idiosyncratic risk and the distance-to-default, as shown in Panel B of Figure 2, prove to be significantly smaller when I estimate them separately for the ranges below and above an ownership stake of 25%. (This alternative definition of $EQGOV_{i,t}$ follows my explanations in section 4.1. Numerical results are not tabulated.) Thus, I conclude that equity and debt governance interact as complements rather than as substitutes, and that concentrated ownership exerts a dominating influence on bank risk if debt governance is relatively weak.

5. Robustness Checks

In subsections 5.1 and 5.2 below, I apply a number of alternative measures of equity and debt governance to check the robustness of my empirical findings. For the sake of brevity, numerical results are not tabulated for these two subsections, but they are available from the author on request.

5.1. Equity Governance: Multiple Owners and Managerial Shareholdings

Multiple owners with shares larger than 5% are present for 383 bank-year observations. On the one hand, multiple blockholders could improve equity governance, but on the other hand, the "free rider" problem and conflicts between large shareholders might cause the opposite. I replace $SHARE1$ with $SHARE3$ and repeat the baseline regressions. An inversely U-shaped link to

bank risk can be observed for total stock return volatility, market risk, and the idiosyncratic volatility.

Managerial shareholdings, which I can only observe for the U.S.-based banks in my sample, represent an important incentive mechanism. I include them as additional regressor in my baseline models. They are significantly related to two risk indicators: to lower market risk and a lower negative distance-to-default; but most importantly, the effects of concentrated ownership remain robust in all of my models.

5.2. Debt Governance: Maturity Structure of Liabilities

Debt governance intensity is likely to differ between debt categories. While I place emphasis on the difference between customer deposits and risky debt, other studies focus on senior vs. subordinated debt (which my data do not disclose separately), or on debt maturity. As it allows for more immediate influence, short-term debt should imply stronger debt governance.

The long-term debt ratio is defined as long-term debt over total liabilities and indicates weaker debt governance. When using it instead of $DEPLIAB$ in my regressions, I cannot find a significant relation to any of my four bank risk indicators, which is possibly due to the fact that the long-term debt ratio does not differentiate between different bank funding modes. In any case, the deposits-to-total liabilities ratio, on which the key results of this paper are based, seems to be a more suitable indicator of market discipline by holders of bank debt.

6. Conclusions

This study provides new and comprehensive evidence on the interplay between equity governance, debt governance, and bank risk. Based on four conceptually different market-based risk indicators, three hypotheses are tested in a sample of 188 listed banks located in the United States or in the Euro area during the period 2002–2007.

Ownership concentration serves as primary measure of equity governance, and I detect a significant non-monotonic relation to bank risk: While ownership stakes below 25% are linked to higher risk, which can be explained with better incentive alignment between shareholders

and bank managers, this relation is reverted for larger blocks, possibly due to entrenchment and risk-aversion. The effect is not only statistically significant, but also substantial in economic terms, as a bank with a 25% blockholder exhibits a 6% higher total volatility, a 4% higher idiosyncratic volatility, a beta factor that is larger by 0.12, or a firm value which is 0.7 standard deviations closer to the default threshold. It is also robust regarding concerns of reverse causality as this finding can by clearly confirmed in dynamic GMM regressions where the potentially endogenous governance variables are instrumented by their lagged values.

Debt market discipline is measured with banks' liability structure, and we see that the more a bank relatively relies on deposits, the more risk it takes. This evidence is consistent with weaker market discipline exerted by depositors; in economic terms, a bank which has 50% of its liabilities issued as deposits exhibits a 9% higher stock return volatility, a 9% higher idiosyncratic volatility, a 0.2 larger beta factor or a firm value that is 1.7 standard deviations closer to default than a bank which does not rely on deposit funding.

In joint analyses of equity and debt governance, we see that the impact of concentrated ownership on bank risk is reduced by up to a half in banks under weak debt governance. Firstly, this means that equity and debt governance interact as complements rather than as substitutes. Secondly, this finding indicates that equity governance by concentrated ownership plays a dominant role in determining bank risk.

Econometrically, my baseline models control for bank-specific fixed effects, which helps to mitigate the problem of endogeneity in the ownership variable. Additionally, I account for concerns of reverse causality by estimating dynamic GMM regression models as a robustness check. The findings are consistent with existing studies on both equity and debt governance, and they contribute to this literature by analyzing large banks in industrial economies, and by providing novel evidence on the interactions of equity and debt governance.

A possible extension of this paper is the investigation of debt governance by providers of interbank lending, which has only rarely been analyzed in the scientific literature (see for recent evidence Dinger and von Hagen, 2009). With the rapid collapse of interbank markets, leading to most severe global consequences, the financial crisis demonstrates once more the importance of this governance factor.

The findings in this study have several implications. Regulators and supervisory authorities, who use their influence to assure the soundness of the banking system, should consider banks' ownership structure and the amount of deposits taken as important indicators of bank risk. The private interests of shareholders and bondholders are also of interest to politicians who decide about the implementation of new governance mechanisms, for example restrictions on executive compensation, so as to prevent another global banking crisis. Furthermore, the different intensity of debt governance by insured depositors and risky bondholders should be considered by bank managers seeking an optimal financing structure.

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Appendix: List of Banks

Panel A: Banks in the U.S.

ALABAMA NATIONAL BANCORP DEL
AMCORE FINANCIAL INC
AMSOUTH BANCORPORATION
ANCHOR BANCORP WISCONSIN INC
ASSOCIATED BANC CORP
ASTORIA FINANCIAL CORP
B B & T CORP
B O K FINANCIAL CORP
B S B BANCORP INC
BANCORPSOUTH INC
BANK NEW YORK INC
BANK OF AMERICA CORP
BANK OF HAWAII CORP
BANK OF NEW YORK MELLON CORP
BANK ONE CORP
BANKNORTH GROUP INC NEW
BAY VIEW CAPITAL CORP
CATHAY BANCORP INC
CHARTER ONE FINANCIAL INC
CHITTENDEN CORP
CITIGROUP INC
CITIZENS BANKING CORP MI
CITY NATIONAL CORP
COLONIAL BANCGROUP INC
COMERICA INC
COMMERCE BANCORP INC NJ
COMMERCE BANCSHARES INC
COMMERCIAL CAPITAL BANCORP INC
COMMERCIAL FEDERAL CORP
COMMUNITY FIRST BANKSHARES INC
COMPASS BANCSHARES INC
CULLEN FROST BANKERS INC
DIME COMMUNITY BANCSHARES
DORAL FINANCIAL CORP
DOWNEY FINANCIAL CORP
EAST WEST BANCORP INC
F N B CORP PA
FIFTH THIRD BANCORP
FIRST BANCORP P R
FIRST HORIZON NATIONAL CORP
FIRST MIDWEST BANCORP DE
FIRST NIAGARA FINANCIAL GROUP IN
FIRST SENTINEL BANCORP INC
FIRST TENNESSEE NATIONAL CORP
FIRST VIRGINIA BANKS INC
FIRSTFED FINANCIAL CORP
FIRSTMERIT CORP
FLEETBOSTON FINANCIAL CORP
FREMONT GENERAL CORP
FRONTIER FINANCIAL CORP
FULTON FINANCIAL CORP PA
G B C BANCORP
GOLDEN WEST FINANCIAL CORP
GREATER BAY BANCORP
GREENPOINT FINANCIAL CORP
HANCOCK HOLDING CO
HARBOR FLORIDA BANCSHARES INC
HIBERNIA CORP
HUDSON CITY BANCORP INC
HUDSON UNITED BANCORP
HUNTINGTON BANCSHARES INC
INDEPENDENCE COMMUNITY BANK
INDYMAC BANCORP INC
INTERNATIONAL BANCSHARES CORP
INVESTORS FINANCIAL SERVS CORP
J P MORGAN CHASE & CO
KEYCORP NEW
M & T BANK CORP
M A F BANCORP INC
MARSHALL & ILSLEY CORP
MERCANTILE BANKSHARES CORP
NATIONAL CITY CORP
NATIONAL COMMERCE FINANCIAL
NET BANK INC
NEW YORK COMMUNITY BANCORP
NEWALLIANCE BANCSHARES INC
NORTH FORK BANCORPORATION NY
NORTHERN TRUST CORP
OCEANFIRST FINANCIAL CORP
OLD NATIONAL BANCORP
P F F BANCORP INC
P N C FINANCIAL SERVICES GRP INC
PACIFIC CAPITAL BANCORP NEW
PACIFIC NORTHWEST BANCORP
PARK NATIONAL CORP
PEOPLES BANK BRIDGEPORT
POPULAR INC
PROSPERITY BANCSHARES INC
PROVIDENT BANKSHARES CORP
PROVIDENT FINANCIAL GROUP INC
PROVIDENT FINANCIAL SVCS INC
REGIONS FINANCIAL CORP
REPUBLIC BANCORP
ROSLYN BANCORP INC
S V B FINANCIAL GROUP
SKY FINANCIAL GROUP INC
SOUTH FINL GROUP INC
SOUTHTRUST CORP
SOUTHWEST BANCORP OF TEXAS INC
SOVEREIGN BANCORP INC
STATEN ISLAND BANCORP INC
STERLING BANCSHARES INC
STERLING FINANCIAL CORP WASH
SUNTRUST BANKS INC
SUSQUEHANNA BANCSHARES INC PA
SYNOVUS FINANCIAL CORP
T C F FINANCIAL CORP
T D BANKNORTH INC
TEXAS REGIONAL BANCSHARES INC
TRUSTCO BANK CORP NY
TRUSTMARK CORP
U C B H HOLDINGS INC
U S BANCORP DEL
UMPQUA HOLDINGS CORP
UNION PLANTERS CORP
UNIONBANCAL CORP
UNITED BANKSHARES INC
UNITED COMMUNITY BANKS INC GA
VALLEY NATIONAL BANCORP
W HOLDING CO INC
WACHOVIA CORP 2ND NEW
WASHINGTON FEDERAL INC
WASHINGTON MUTUAL INC
WEBSTER FINL CORP WATERBURY
WELLS FARGO & CO NEW
WESTAMERICA BANCORPORATION
WHITNEY HOLDING CORP
WILMINGTON TRUST CORP
WINTRUST FINANCIAL CORPORATION
ZIONS BANCORP

Panel B: Banks in the Euro area

ABN AMRO
ALLIED IRISH BANKS
ALPHA BANK
ANGLO IRISH BANK
BANCA ANTONVENETA
BANCA LOMBARDA E PIEMONTESE
BANCA POPOLARE ITALIANA
BANCHE POPOLARI UNITE
BANCO SABADELL
BANK AUSTRIA CREDITANSTALT
BANK OF IRELAND
BANK OF PIRAEUS
BANKINTER
BAYERISCHE HYPO & VEREINSBANK
BCA CARIGE
BCA FIDEURAM
BCA INTESA
BCA LOMBARDA
BCA MONTE DEI PASCHI DI SIEN
BCA POP. DI BERGAMO VARESINO
BCA POPOLARE COMM E INDUST
BCA POPOLARE DELL'ETRURIA
BCA POPOLARE DI INTRA
BCA POPOLARE DI LODI
BCA POPOLARE DI MILANO
BCA POPOLARE DI SONDRIO
BCO BILBAO VIZCAYA ARGENTARIA
BCO BPI
BCO COMERCIAL PORTUGUES
BCO DE VALENCIA
BCO DI DESIO E DELLA BRIANZA
BCO ESPIRITO SANTO
BCO GUIPUZCOANO
BCO PASTOR
BCO POPULAR ESPANOL
BCO SABADELL
BCO SANTANDER
BNC GUIPUZCOANO
BNC.DE VALENCIA
BNL BCA NAZIONALE DEL LAVOR
BNP
BPU BANCHE POPOLARI UNITE
CAPITALIA
CASSA DI RISPARMIO DI FIRENZE
COMMERZBANK
CREDIT AGRICOLE
CREDIT LYONNAIS
CREDITO EMILIANO
CREDITO VALTELLINES
DEPFA BANK PLC
DEUTSCHE BANK
DEUTSCHE POSTBANK
DEXIA
EFG EUROBANK ERGASIAS
EMPORIKI BANK OF GREECE
ERSTE BANK AUSTRIA
FORTIS
GROUPE SOCIETE GENERALE
IKB DEUTSCHE INDUSTRIEBANK
INTERBANCA
INTESA SANPAOLO
KBC BANCASSURANCE
MEDIOBANCA
NATEXIS
NATIONAL BANK OF GREECE
NATIXIS
PIRAEUS BANK
RAIFFEISEN INTERNATIONAL BANK
SAN PAOLO IMI
UBI BCA
UNICREDITO ITALIANO

Table 1: Summary statistics of publicly listed banks

Panel A: Pearson's correlation coefficients (averages over time)

This panel displays the correlation of risk measures. To control for the panel structure of the data, I calculate Pearson's correlation coefficients for each year and transform them into Fisher's Z values, of which I derive the arithmetic mean and its statistical significance. The values reported have been re-converted into Pearson's correlation coefficients.

Variables	$TOTVOLA$	$MKTRISK$	$IDIVOLA$	$-DISTDEF$
$TOTVOLA$	1.000^{***}			
$MKTRISK$	0.599^{***}	1.000^{***}		
$IDIVOLA$	0.899^{***}	0.212^{**}	1.000^{***}	
$-DISTDEF$	0.874^{***}	0.581^{***}	0.746^{***}	1.000^{***}

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Panel B: Descriptive statistics for main variables

Variable	Description	Mean	Median	St.Dev.	Min.	Max.	Obs.
	Equity Governance						
$SHARE1$	Largest share (if > 5%)	17.8%	9.5%	18.7%	5.01%	95.0%	614
$SHARE3$	Three largest shares (if > 5%)	25.1%	19.1%	19.7%	5.01%	95.0%	614
	Debt Governance						
$DEPLIAB$	Customer Deposits/Total Liabil.	64.9%	69.2%	19.3%	0	99.1%	933
$LTDLIAB$	Long-Term Debt/Total Liabil.	15.2%	12.0%	12.7%	0	96.4%	933
	Risk						
$TOTVOLA$	Total Risk: Return Volatility σ_i	25.0%	23.1%	9.1%	6.2%	67.9%	933
$MKTRISK$	Market Risk: β_i w.r.t. bank index	0.89	0.90	0.31	–0.03	1.74	933
$IDIVOLA$	Idiosyncratic Risk: $\sigma_{\epsilon i}$	18.9%	17.6%	7.5%	6.1%	58.6%	933
$-DISTDEF$	Negative Distance-to-Default	-4.94	-4.72	-1.75	-16.41	-1.46	933
	Control Variables						
$FIRMVAL$	Merton-Firmvalue/Book Assets	0.98	0.98	0.11	0.58	1.42	933
$TOTASSET$	Total Assets (billion USD)	122.4	20.8	274.5	0.7	2187.6	933
$LOGASSET$	ln(Total Assets)	10.25	9.95	1.63	6.57	14.60	933
$EQASSET$	Equity/Total Assets	8.0%	7.8%	3.11%	0.79%	22.6%	933

Table 2: Equity governance and bank risk (quadratic models)

The dependent variable is the stock return volatility ($TOTVOLA_{i,t}$), the beta factor with respect to the banking market calculated from a single-index model ($MKTRISK_{i,t}$), the idiosyncratic volatility ($IDIVOLA_{i,t}$), or the negative distance-to-default from a Merton (1974) model ($-DISTDEF_{i,t}$). The main explanatory variable is the largest owner's share as linear term ($SHARE1_{i,t}$) and quadratic term $(SHARE1_{i,t})^2$. Control variables are the charter value ($FIRMVAL_{i,t}$), the natural logarithm of total book assets ($LOGASSET_{i,t}$), the equity-to-total assets ratio ($EQASSET_{i,t}$) and interacted US*year dummies (δ_{t*US}) as well as bank-level fixed effects (δ_i). Panel A reports coefficient estimates with Huber-White robust standard errors in parentheses. Panel B displays the overall impact of the linear and quadratic term for the largest owner's share in each regression model (1)–(4) graphically.

Panel A:

Model	**(1)**	**(2)**	**(3)**	**(4)**
Dependent Variable	$TOTVOLA$	$MKTRISK$	$IDIVOLA$	$-DISTDEF$
Largest Owner's Share	0.452***	1.179**	0.304***	6.436**
($SHARE1$)	(0.124)	(0.464)	(0.102)	(2.960)
(Largest Owner's Share)^2	-0.631***	-1.963***	-0.407***	-9.862**
$(SHARE1)^2$	(0.129)	(0.477)	(0.111)	(4.378)
Merton-Firmvalue / Book Assets	-0.033	0.160	-0.041	0.680
($FIRMVAL$)	(0.089)	(0.249)	(0.076)	(1.455)
log(Total Assets)	0.002	0.045	-0.007	0.102
($LOGASSET$)	(0.019)	(0.067)	(0.017)	(0.349)
Book Equity / Total Assets	-0.393	-0.792	-0.379	-2.324
($EQASSET$)	(0.301)	(0.984)	(0.273)	(5.113)
Intercept	0.346	0.121	0.362*	-5.501
	(0.240)	(0.775)	(0.214)	(4.345)
Bank-level fixed effects	yes	yes	yes	yes
Interacted US*year dummies	yes	yes	yes	yes
Number of observations	933	933	933	933
Number of banks	188	188	188	188
R^2 (within)	0.592	0.303	0.379	0.545

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Panel B:

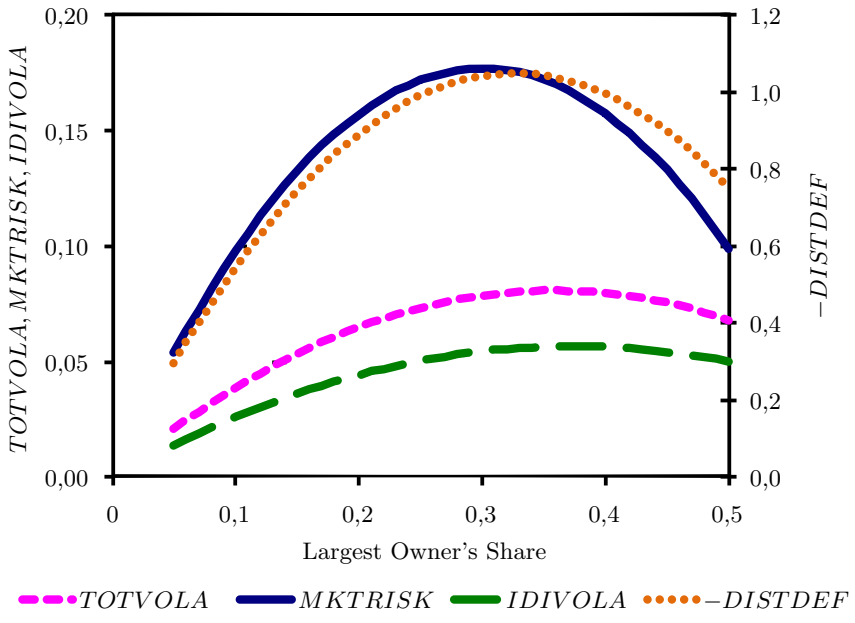

Table 3: Equity governance and bank risk (piecewise models)

All regression models are specified as explained in Table 2, apart from a piecewise specification of the main explanatory variable $SHARE1_{i,t}$, which enters once truncated at the 25%-level as $\max\{SHARE1, 25\%\}$, and additionally for large blocks exceeding the 25% threshold as $\max\{SHARE1 - 25\%, 0\}$. Control variables are included as in Table 2. Regression models (1a)–(4a) are estimated using the least squares method with bank-level fixed effects, while coefficient estimates for models (1b)–(4b) rely on the two-step *System GMM* estimator introduced by Blundell and Bond (1998) with Windmeijer's (2005) finite sample correction. *GMM*-type instruments are $RISK_{i,t-2}, \max\{SHARE1_{i,t-2}, 25\%\}, \max\{SHARE1_{i,t-2} - 25\%, 0\}, FIRMVAL_{i,t-2}, LOGASSET_{i,t-1}, EQASSET_{i,t-2}$, and higher lags. Bank-level fixed effects are purged by the first-differencing of instruments. Robust standard errors are reported in parentheses.

Estimation method	Least Squares				Generalized Method of Moments			
Model	**(1a)**	**(2a)**	**(3a)**	**(4a)**	**(1b)**	**(2b)**	**(3b)**	**(4b)**
Dependent Variable ($RISK_{i,t}$)	$TOTVOLA$	$MKTRISK$	$IDIVOLA$	$-DISTDEF$	$TOTVOLA$	$MKTRISK$	$IDIVOLA$	$-DISTDEF$
Lagged Dependent Variable					0.508***	0.451***	0.555***	0.751***
($RISK_{i,t-1}$)					(0.039)	(0.050)	(0.077)	(0.100)
Largest Owner's Share (5%–25%)	0.391***	1.088**	0.246**	6.085**	0.330**	0.319***	1.122**	3.827*
($\max\{SHARE1, 25\%\}$)	(0.139)	(0.440)	(0.108)	(2.605)	(0.137)	(0.089)	(0.490)	(2.214)
Largest Owner's Share (> 25%)	-0.242***	-1.007***	-0.136**	-4.586**	-0.223***	-0.204***	-0.961***	-5.237***
($\max\{SHARE1 - 25\%, 0\}$)	(0.072)	(0.195)	(0.062)	(2.293)	(0.088)	(0.078)	(0.297)	(1.528)
Merton-Firmvalue / Book Assets	-0.042	0.129	-0.046	0.524	-0.100	-0.109	0.110	1.716
($FIRMVAL$)	(0.090)	(0.251)	(0.077)	(1.440)	(0.093)	(0.079)	(0.309)	(2.349)
log(Total Assets)	-0.004	0.050	-0.006	0.127	-0.007**	-0.012**	0.022*	0.033
($LOGASSET$)	(0.019)	(0.067)	(0.017)	(0.358)	(0.003)	(0.005)	(0.012)	(0.132)
Book Equity / Total Assets	-0.402	-0.816	-0.386	-2.444	-0.388**	-0.309*	-1.108	-1.592
($EQASSET$)	(0.301)	(0.956)	(0.276)	(5.059)	(0.163)	(0.170)	(0.704)	(3.461)
Intercept	0.339	0.100	0.357**	-5.605	0.308	0.340***	0.008	-2.650
	(0.166)	(0.770)	(0.216)*	(4.410)	(0.113)	(0.121)	(0.360)	(2.578)
Interacted US*year dummies	yes	yes	yes	yes	yes	yes	yes	yes
Bank-level fixed effects	yes	yes	yes	yes	no	no	no	no
R^2 (within)	0.590	0.303	0.375	0.545				
Test for AR(1): Pr > z					0.000	0.000	0.000	0.000
Test for AR(2): Pr > z					0.256	0.994	0.175	0.101
Hansen test: Pr > χ^2					0.391	0.401	0.045	0.078
Difference-in-Hansen test: Pr > χ^2					0.426	0.846	0.551	0.482
Number of observations	933	933	933	933	744	744	744	744
Number of banks	188	188	188	188	175	175	175	175
Number of instruments					99	99	99	99

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Table 4: Debt governance and bank risk

The dependent variable is alternatively the stock return volatility ($TOTVOLA_{i,t}$), the beta factor with respect to the banking market calculated from a single-index model ($MKTRISK_{i,t}$), the idiosyncratic volatility ($IDIVOLA_{i,t}$), or the negative distance-to-default from a Merton (1974) model ($-DISTDEF_{i,t}$). The main explanatory variable is the ratio of customer deposits to total liabilities ($DEPLIAB_{i,t}$). As control variables serve the natural logarithm of total bank assets ($LOGASSET_{i,t}$), and the equity-to-total assets ratio ($EQASSET_{i,t}$). A full set of interacted US*year dummies (δ_{t*US}) as well as bank-level fixed effects are also included. Huber-White robust standard errors are reported in parentheses.

Model	**(1)**	**(2)**	**(3)**	**(4)**
Dependent Variable	$TOTVOLA$	$MKTRISK$	$IDIVOLA$	$-DISTDEF$
Deposits / Total Liabilities	0.181**	0.403*	0.181***	3.363**
($DEPLIAB$)	(0.071)	(0.229)	(0.060)	(1.559)
log(Total Assets)	0.029	0.115	0.014	0.529
($LOGASSET$)	(0.020)	(0.078)	(0.015)	(0.465)
Book Equity / Total Assets	-0.590*	-1.353	-0.554*	-6.107
($EQASSET$)	(0.321)	(1.047)	(0.296)	(5.612)
Intercept	-0.021	-0.581	0.020	-10.633**
	(0.217)	(0.842)	(0.169)	(5.311)
Bank-level fixed effects	yes	yes	yes	yes
Interacted US*year dummies	yes	yes	yes	yes
N	933	933	933	933
R^2 (within)	0.582	0.274	0.385	0.537

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Table 5: Bank risk and the interplay of equity and debt governance

The dependent variable is alternatively the stock return volatility ($TOTVOLA_{i,t}$), the beta factor with respect to the banking market calculated from a single-index model ($MKTRISK_{i,t}$), the idiosyncratic volatility ($IDIVOLA_{i,t}$), or the negative distance-to-default from a Merton (1974) model ($-DISTDEF_{i,t}$). The explanatory variables are the largest owner's share, which I include as linear term ($SHARE1_{i,t}$) and quadratic term ($SHARE1^2_{i,t}$), the ratio of customer deposits to total liabilities ($DEPLIAB_{i,t}$), and the interaction terms of an indicator dummy variable for "deposit takers"—banks which strongly rely on deposit funding ($DEPLIAB_{i,t} > 69.2\%$, median split)—and my ownership variables $SHARE1_{i,t}$ and $SHARE1^2_{i,t}$. As control variables serve the natural logarithm of total bank assets ($LOGASSET_{i,t}$), and the equity-to-total assets ratio ($EQASSET_{i,t}$). In Models (1a)–(4a), A full set of interacted US*year dummies (δ_{t*US}) as well as bank-level fixed effects are also included. Models (1b)–(4b) include also the lagged dependent variable, and they are estimated using the two-step *System GMM* estimator introduced by Blundell and Bond (1998) with Windmeijer's (2005) finite sample correction. In these models, bank-level fixed effects are purged by the forward orthogonal deviations transform of instruments. Robust standard errors are reported in parentheses.

Panel A: Least Squares Models

Model	**(1a)**	**(2a)**	**(3a)**	**(4a)**
Dependent Variable	$TOTVOLA$	$MKTRISK$	$IDIVOLA$	$-DISTDEF$
Largest Owner's Share	0.515***	1.375***	0.350***	7.722***
($SHARE1$)	(0.138)	(0.427)	(0.108)	(2.977)
(Largest Owner's Share)^2	-0.666***	-2.083***	-0.427***	-10.697***
($SHARE1)^2$	(0.130)	(0.438)	(0.104)	(4.052)
Deposits / Total Liabilities	0.202***	0.349	0.210***	3.858***
($DEPLIAB$)	(0.076)	(0.232)	(0.063)	(1.407)
Largest Owner's Share for "dep. takers"	-0.189	0.006	-0.202**	-4.373*
($SHARE1$ if $DEPLIAB > 69.2\%$)	(0.109)	(0.991)	(0.090)	(2.250)
(Largest Owner's Share)^2 for "dep. takers"	0.193	-0.509	0.265*	4.892
($SHARE1^2$ if $DEPLIAB > 69.2\%$)	(0.162)	(0.737)	(0.140)	(3.403)
log(Total Assets)	0.017	0.063	0.008	0.296
($LOGASSET$)	(0.018)	(0.069)	(0.015)	(0.351)
Book Equity / Total Assets	-0.494	-0.975	-0.496*	-4.148
($EQASSET$)	(0.317)	(0.976)	(0.291)	(5.365)
Intercept	0.042	-0.138	0.039	-9.146**
	(0.197)	(0.742)	(0.161)	(3.990)
Bank-level fixed effects	yes	yes	yes	yes
Interacted US*year dummies	yes	yes	yes	yes
N	933	933	933	933
R^2 (within)	0.603	0.308	0.404	0.557

Significance levels: *: 10% **: 5% ***: 1%

Table 5 (continued)

Panel B: Dynamic GMM Models

Model	**(1)**	**(2)**	**(3)**	**(4)**
Dependent Variable	$TOTVOLA$	$MKTRISK$	$IDIVOLA$	$-DISTDEF$
Lagged Dependent Variable	0.507***	0.540***	0.503***	0.717***
	(0.051)	(0.082)	(0.055)	(0.079)
Largest Owner's Share (5%–25%)	0.323***	0.785*	0.276***	5.598***
($SHARE1$, truncated at 0.25)	(0.096)	(0.409)	(0.076)	(2.060)
Largest Owner's Share (> 25%)	-0.224***	-0.929***	-0.156***	-4.602***
($SHARE1 - 0.25$ if $SHARE1 > 0.25$)	(0.082)	(0.289)	(0.058)	(1.657)
Deposits / Total Liabilities	-0.054	-0.005	-0.061	-0.159
($DEPLIAB$)	(0.072)	(0.189)	(0.071)	(0.928)
L. Owner's Share (5%–25%) for "dep. takers"	0.020	-0.030	-0.007	-1.749
($SHARE1$, trunc. at 0.25, if $DEPLIAB > 69.2\%$)	(0.159)	(0.482)	(0.135)	(2.897)
L. Owner's Share (> 25%) for "dep. takers"	0.064	0.217	0.043	1.602
($SHARE1 - 0.25$ if $DEPLIAB > 69.2\%$)	(0.128)	(0.407)	(0.097)	(2.060)
log(Total Assets)	-0.008**	0.021*	-0.009*	0.012
($LOGASSET$)	(0.004)	(0.012)	(0.005)	(0.111)
Book Equity / Total Assets	-0.242*	-1.835***	-0.138	-2.776
($EQASSET$)	(0.134)	(0.656)	(0.132)	(2.506)
Intercept	0.263***	0.217	0.218**	-1.210
	(0.082)	(0.216)	(0.090)	(1.222)
Interacted US*year dummies	yes	yes	yes	yes
N	744	744	744	744
Test for AR(1): Pr > z	0.000	0.000	0.000	0.000
Test for AR(2): Pr > z	0.338	0.194	0.258	0.047
Hansen test: Pr > χ^2	0.437	0.477	0.436	0.137
Difference-Hansen tests				
Full set: Pr > χ^2	0.276	0.833	0.846	0.499
Dep. var. subset: Pr > χ^2	0.591	0.867	0.797	0.971
Number of instruments	127	127	127	127

Significance levels: $*$: 10% $**$: 5% $***$: 1%

Figure 1: Equity governance and bank risk

The horizontal dimension indicates equity governance intensity, as measured by the largest owner's share. The vertical axis displays the residuals from a regression of bank stock price losses during the year 2008 on the control variables $LOGASSET_{i,2006}$ and $EQASSET_{i,2006}$ and a dummy variable indicating U.S. banks. The line represents the mean values from a fractional polynomial, and the shaded area their 95% confidence interval.

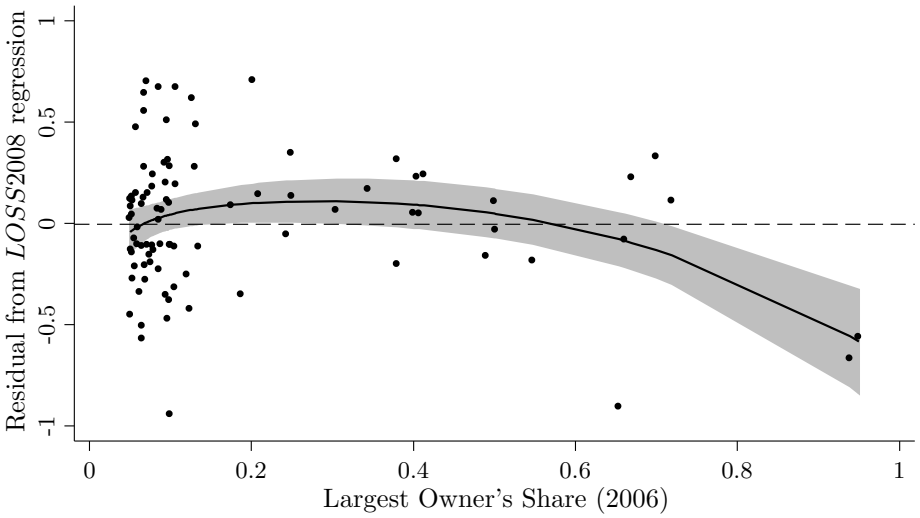

Figure 2: Bank ownership, deposit taking, and bank risk

These graphs display the overall impact of the linear and quadratic term for the largest owner's share in my interacted fixed-effects regression models for bank risk (Table 5). The horizontal dimension scales equity governance intensity, as measured by the largest owner's share. I differentiate banks into "deposit takers"—banks which strongly rely on deposit funding ($DEPLIAB_{i,t} > 69.2\%$, median split)—and others. The aggregate (linear and quadratic) relation to my four indicators of bank risk is displayed in broken lines for "deposit takers", and in solid lines for other banks.