Bangor Business School Working Paper

BBSWP/12/001

Moral hazards, dividends, and risk in banks

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January 2012

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Moral hazard, dividends, and risk in banks[†]

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Abstract

The relation between dividends and bank soundness has recently drawn much attention from both academics and policy makers. However, the existing literature lacks an investigation of the relation between dividends and bank risk taking. I find a positive relation between default risk and payout ratios, although this relation is insignificant for very high levels of default risk. Capital requirements and the desire to preserve the charter can offset the positive relation between default risk and payout ratios. Dividends can increase despite very high default risk, and during the recent financial crisis many banks paid out dividends after recording a loss.

Keywords: Dividend, bank risk, moral hazard
JEL classification: G21, G35

[†] Previous versions of the paper have been presented at the 8th annual meeting of Eurofidai (Paris, December 2010), the 37th annual meeting of the European Finance Association (EFA, Frankfurt, August 2010), the 22nd Australasian Finance and Banking Conference (AFBC, Sydney, December 2009), the UKEPAN conference (Leicester, November 2009), and a seminar at Bangor University (November 2009). I wish to thank John Doukas (the editor), John Goddard, Klaus Schaeck, Bob DeYoung, David Roodman, Clovis Rugemintwari (Eurofidai annual meeting discussant), André Güttler (EFA discussant), Balasingham Balachandran (AFBC discussant), Andrea Sironi, Philip Molyneux, Jonathan Williams, Owain ap Gwilym, Lynn Hodgkinson, Graham Partington, Tim Zhou, Angelo Zago, Sven Bornemann, and all participants at the foregoing conferences and seminar.

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Although many financial institutions have returned to profitability in recent quarters, […] it is important that firms retain these profits in order to rebuild capital to support lending after official support measures have been removed.

Financial Stability Board (2009, p. 1)

1. Introduction

Implicit or explicit government bailout guarantees (such as deposit insurance) can generate incentives for banks to increase default risk (Merton, 1977). This is a classical example of moral hazard. Capital adequacy regulations (1988 Basel Accord and subsequent refinements) should reduce moral hazard because they require larger capital buffers for increasingly high levels of bank risk. Charter value can also impinge on bank risk taking: When charter value is high, the potential gains from exploiting a bailout can be smaller than the loss of the charter value (Hellmann *et al.*, 2000), and therefore the incentive to exploit the government guarantee can become negligible.

Since dividends[1] increase the value of a government guarantee (Ronn and Verma, 1986), they can exacerbate moral hazard. Paying dividends is a way to transfer wealth from the creditors of a bank (and the taxpayer) to the bank owners. In the absence of specific regulations that curb dividends when a bank is in distress, there is an incentive to pay large dividends to exploit the government guarantee (see Section 2.1). There is evidence that during the financial crisis of 2007–2009,[2] some major banks continued to pay out dividends despite expecting large credit losses (Acharya *et al.*, 2011). To prevent this, it has been suggested that restrictions on dividends should be included in a set of 'ladder of sanctions' for banks that do not satisfy certain regulatory requirements in terms of solvency and liquidity (Brunnermeier *et al.*, 2009). Such measures are now part of the Basel III framework.[3]

During the financial crisis of 2007–2009, the relation between dividends and bank soundness has drawn much attention from both academics and policy makers. However, the existing literature lacks an investigation of the relation between dividends and bank risk taking. I fill this

[1] I use the term *dividends* to refer to cash dividends throughout the paper.
[2] For a succinct appraisal of the main developments that resulted in a build-up of risk in the financial sector prior to the 2007–2009 crisis (particularly the role of low interest rates), see Rajan (2006). For a review of the main factors that resulted in the 'subprime panic', see Gorton (2009).
[3] In the new framework, the holding companies of banking groups must hold a 'capital conservation buffer' of 2.5% in addition to the tier 1 capital (raised to 6% of total risk-weighted assets). Once this buffer is eroded below 2.5%, the bank is subject to dividend restrictions (and restrictions to staff bonuses and share buybacks). These constraints get stricter as the buffer decreases (Caruana, 2010).

gap by examining the role of dividends as a risk-shifting mechanism that can exacerbate moral hazard deriving from (implicit or explicit) government guarantees.

The main hypothesis tested in the paper, the risk-shifting hypothesis, posits that default risk is positively related to dividends, since banks can pay dividends to transfer default risk to their creditors and (when bailouts take place) to the taxpayer. In addition to the risk-shifting hypothesis, this paper investigates two secondary hypotheses, relating to the influence of capital requirements and charter values: According to the opportunity cost hypothesis, undercapitalised banks should decrease dividends to avoid future actions by the regulators. According to the charter value hypothesis, banks with high charter values should be discouraged from paying dividends to preserve the charter.

I test the three hypotheses above on a sample of banks employing different econometric specifications and allowing for the influence of standard determinants of payout ratios. I also provide two main extensions to this analysis. First, to further investigate the risk-shifting hypothesis, I examine the impact of very high default risk on dividend (percentage) changes. Second, I examine the impact of quarterly losses on the dividends-to-assets ratio (for comparability with Acharya *et al.*, 2011) during the 2007–2009 financial crisis.

Overall, I find little evidence of risk shifting. However, some of the results suggest that many banks do very little to improve their soundness: The average payout ratio is higher for very high levels of default risk than for normal or low levels of default risk; dividend payments can keep increasing (although at a lower growth rate) despite very high default risk; during the 2007–2009 financial crisis, quarterly payout ratios (dividends to assets) did not decrease immediately, but only as the crisis unfolded, and many banks kept on paying dividends even after recording a loss.

This paper contributes to the existing literature in several ways. First, it provides novel evidence of a positive relation between default risk and payout ratios in banking. However, this relation is insignificant for banks that are very close to default, contrary to the risk-shifting hypothesis. Moreover, very high default risk results in smaller (positive) dividend changes or, for listed banks, dividend cuts. These results suggest that, while there may be an association between bank risk taking and payout ratios, banks do not shift risk using dividends when they are very close to default.

Second, this study provides evidence regarding the impact of capital requirements and charter value on dividends. Banks with low capital ratios (equity to total assets) and whose regulatory capital ratios are close to the minimum requirement tend to have significantly lower payout ratios than well-capitalised banks. The negative impact of capital requirements on payout ratios tends to offset the positive impact of default risk. These results are consistent with the view that capital adequacy regulations reduce bank risk taking. I also provide evidence that banks with high charter value tend to distribute fewer dividends, consistent with the view that when charter value is high, banks have an incentive to preserve the charter.

Third, this paper finds that during the 2007–2009 financial crisis the average quarterly payout ratios (dividends to assets) of US banks did not decrease immediately, but only as the crisis unfolded. However, a more detailed investigation shows that quarterly losses were followed by significantly lower payout ratios, and these reductions were even stronger for banks with a high default risk or high charter value.

Finally, this study provides a methodological contribution to the modelling of payout ratios (dividends to net income, or *DP*). Recent empirical studies on the determinants of payout ratios in non-financial firms (Li and Zhao, 2008; Chay and Suh, 2009) neglect the autoregressive nature of the payout ratio. Since the lagged payout ratio may well be correlated with other determinants of the current payout ratio, this approach can lead to omitted variable bias. I employ a dynamic panel data model to adequately model an autoregressive component in the payout ratio.

The remainder of the paper is organised as follows. Section 2 reviews the literature and develops the hypotheses. Section 3 describes the methodology and the data set. Section 4 reports the main results and robustness checks. Section 5 provides further tests of the risk-shifting hypothesis. Section 6 summarises and concludes.

2. Related Literature and Hypotheses

I borrow from two strands of literature to develop my hypotheses. The first strand investigates the determinants of the dividend policy of non-financial firms. The second strand relates to the relation between regulations and attitudes towards risk in banking and the possibility that certain types of regulation produce moral hazard.[4] The literature on the dividend policy of non-financial firms argues that, other things being equal, risk should reduce dividend payments (Bar-Yosef

[4] Recent literature has investigated whether regulations in the financial sector (particularly deposit insurance and capital adequacy regulation) impinge on the determinants of the financing decisions of banks (Gropp and Heider, 2010). This paper assumes a similar perspective, in that it investigates the dynamics of the relation between dividends and risk under bank regulations.

and Huffman, 1986). The banking literature has so far overlooked the topic of dividend policy, with some exceptions (Bessler and Nohel, 1996, 2000; Cornett *et al.*, 2008).

This section illustrates the importance of the relation between dividends and bank risk taking and explains how capital adequacy regulation and heterogeneity in charter values can impinge on it.

Section 2.1 develops the risk-shifting hypothesis, regarding the relation between dividends and default risk. Section 2.2 develops the opportunity cost hypothesis, regarding the relation between dividends and capital ratios. Section 2.3 illustrates the charter value hypothesis, regarding the relation between dividends and charter value.

2.1. Government guarantees and risk shifting

Bessler and Nohel (1996) suggest that dividends can be used to divert a bank's equity to its owners. The authors report that 'most banks continued to distribute dividends during the 1980s despite suffering large losses' (Bessler and Nohel, 1996, p. 1490). As happens in many cases, history repeats itself and, as reported by Acharya *et al.* (2011), during the recent global financial crisis, 'even as the banking system suffered the depletion of common equity through losses on the asset portfolio, banks continued to pay dividends throughout the crisis' (Acharya *et al.*, 2011, p. 3).

Deposit insurance regulations, and government guarantees in general, may increase the likelihood of moral hazard in the form of excessive risk taking because it discourages monitoring by depositors.[5] Moreover, deposit insurance can be thought of as a put option on the bank's assets (Merton, 1977), whose value is positively related to business risk and leverage. Under a fixed-rate system, banks can exploit the deposit insurance by increasing leverage and risk (Keeley, 1990).[6] In the event of a default, banks can exploit the deposit insurance to obtain wealth from the insuring agency. Accordingly, the value of deposit insurance is positively related to default risk. Dividends play an important role in this model, since they decrease the value of assets, which implies a decrease in the value of both equity and debt, but benefit only the owners of the bank – equity is 'dividend protected' (Ronn and Verma, 1986). Therefore, higher dividends increase default risk and the value of deposit insurance. This model can be applied to any kind of government guarantee (implicit or explicit). Moreover, banks tend to sell

[5] For countries without a deposit insurance scheme, there may be an implicit guarantee of bailout in the event of a financial crisis (Hellmann *et al.*, 2000).
[6] Schemes with a more sophisticated fee structure can help reduce moral hazard (Chan *et al.*, 1992; Gianmarino *et al.*, 1993).

their safer assets to distribute dividends (Acharya *et al.*, 2011). Based on the impact of government guarantees on the pricing of a bank's assets, the main hypothesis tested in this paper is as follows.

H_1: Risk-shifting hypothesis

Default risk is positively related to dividends.

2.2. The role of capital requirements

To restrain moral hazard deriving from government guarantees, bank regulators have introduced capital requirements proportional to a bank's risky assets. Capital requirements should counteract moral hazard because they force banks to internalise the adverse consequences of excessive risk taking. Undercapitalised banks can improve their capital position either by means of dividend cuts or by issuing new equity capital. Because raising new equity capital is expensive (Hellmann *et al.*, 2000), paying dividends implies foregoing the opportunity to raise the required capital (at no additional cost) by retaining earnings. Therefore, dividends represent an opportunity cost for undercapitalised banks, and these banks should distribute a smaller percentage of earnings than well-capitalised banks.

H_2: Opportunity cost hypothesis

Undercapitalised banks pay fewer dividends than well-capitalised banks.

2.3. The role of charter value

Charter value can be defined as the present value of a bank's expected future profits as a going concern. When charter values are high, banks have an incentive not to risk liquidation because it would prevent bank owners from selling the charter (i.e., the charter value would be lost). However, when charter values are low, banks have little to lose and the incentive to gamble and exploit the government guarantees can be high (Keeley, 1990).[7] Therefore, banks with high charter values should be less inclined to engage in risk shifting via dividend payments. These considerations lead to the following hypothesis:

[7] For instance, Keeley (1990) ascribes the US savings and loans crisis of the 1980s to more intense competition between banks (driven by deposit rate deregulation). Fiercer competition caused a decline in the charter value of the savings and loans. In such circumstances, banks were incentivised to exploit the put option implied by the deposit insurance scheme. However, any type of government guarantee (such as deposit insurance regulations) ensures lower refinancing costs to protected banks, leading to higher charter values (Gropp *et al.*, 2010).

H_3: Charter value hypothesis

Charter value is negatively related to dividends.

3. Methodology and Data

3.1. Methodology

I investigate the nexus between payout ratios and bank risk taking using three econometric models: an ordinary least squares (OLS) model, a panel data model with fixed effects (FEM), and a dynamic panel data model. Previous literature on the determinants of payout ratios uses *DP* as a dependent variable. This ratio becomes infinite when earnings are zero, and when earnings are negative there is a negative relation between dividends and the payout ratio. Because dividend payments can be regarded as equity issues when earnings are negative, negative *DP* is treated as zero, as in Chay and Suh (2009).[8]

The specification of the model is as follows:

$$Y_{it} = \alpha + \rho Y_{it-1} + \boldsymbol{\beta}'\mathbf{x_{it}} + \boldsymbol{\gamma}'\mathbf{c_{it}} + \varepsilon_{it} \quad (1)$$

$$\varepsilon_{it} = \eta_i + v_{it}$$

$$E[\eta_i] = E[v_{it}] = E[\eta_i, v_{it}]$$

$$\eta_i \sim N(0, \sigma^2_\eta), \text{ and } v_{it} \sim N(0, \sigma^2)$$

where $i = 1, 2, \ldots, N$ indexes observational units; $t = 1, 2, \ldots, T$ indexes time; Y_{it} is the proxy for the payout ratio, *DP*; $\boldsymbol{\beta}$ and $\boldsymbol{\gamma}$ are vectors of coefficients; $\mathbf{x_{it}}$ is a vector of covariates, including the main explanatory variables associated with the three hypotheses; and $\mathbf{c_{it}}$ is a vector of controls. For convenience, let $\mathbf{z_{it}}$ denote both $\mathbf{x_{it}}$ and $\mathbf{c_{it}}$. The error term ε_{it} consists of an unobserved panel-level effect η_i (fixed for each bank *i*) and an idiosyncratic component v_{it} (independent and identically distributed over all observations).

Due to the presence of the lagged dependent variable Y_{it-1} among the regressors, a dynamic panel data specification should be preferred to the other specifications for the following reasons. First, consider the following model:

$$Y_{it} = \alpha + \boldsymbol{\beta}'\mathbf{x_{it}} + \boldsymbol{\gamma}'\mathbf{c_{it}} + \varepsilon_{it} \quad (2)$$

[8] I thank an anonymous referee for this remark.

If equation (2) describes correctly the data generation process for Y_{it}, an OLS model can lead to biased and inconsistent estimates if E($\mathbf{z_{it}}$, η_i) ≠ 0. The FEM provides consistent estimates because it eliminates η_i by subtracting the time mean of equation (2) from equation (2) itself:

$$Y^*_{it} = \boldsymbol{\beta}'\mathbf{x}^*_{it} + \boldsymbol{\gamma}'\mathbf{c}^*_{it} + v^*_{it} \tag{3}$$

where

$$Y^*_{it} = Y_{it} - \frac{1}{T}\sum_{t=1}^{T} Y_{it} \quad \mathbf{x}^*_{it} = \mathbf{x}_{it} - \frac{1}{T}\sum_{t=1}^{T}\mathbf{x}_{it} \quad \mathbf{c}^*_{it} = \left(\mathbf{c}_{it} - \frac{1}{T}\sum_{t=1}^{T}\mathbf{c}_{it}\right) \quad v^*_{it} = \left(\eta_i - \eta_i + v_{it} - \frac{1}{T}\sum_{t=1}^{T} v_{it}\right)$$

However, if equation (1) describes correctly the data generation process for Y_{it}, both OLS and FEM can lead to biased and inconsistent estimates, because the correlation between $Y^*_{it-1} = Y_{it-1} - \overline{Y}_i$ (where $\overline{Y}_i = (1/T-1)\sum_{t=1}^{T-1} Y_{it}$) and $v^*_{it} = v_{it} - \overline{v}_i$ (where $\overline{v}_i = (1/T-1)\sum_{t=2}^{T} v_{it}$) leads to E(Y^*_{it-1}, v^*_{it}) ≠ 0 (Bond, 2002). Moreover, if there is correlation between Y_{it-1} and $\mathbf{z_{it}}$, excluding Y_{it-1} from the regressions will result in omitted variable bias.

As explained by Bond (2002), while the OLS estimator of ρ in equation (1) is upward biased, the FEM estimator of ρ is downward biased. A consistent estimator of ρ should therefore produce estimates of ρ that lie between those produced by OLS and the FEM.

The generalised method of moments (GMM) estimator, developed by Arellano and Bond (1991) and refined by Arellano and Bover (1995) and Blundell and Bond (1998), eliminates η_i via differencing (similar to the FEM), and allows for E(ΔY_{it-1}, Δv_{it}) ≠ 0 using the lagged levels of Y_{it-1} as instruments (Y_{it-2} is correlated to ΔY_{it-1} but uncorrelated to Δv_{it}). While Arellano and Bond's (1991) estimator (GMM-DIF) employs only lagged levels of Y_{it-1} as instruments in the first-differenced equation, Blundell and Bond's (1998) estimator (GMM-SYS), based upon Arellano and Bover (1995), involves a system of first-differenced and level equations, where lags of levels (in the former) and lags of the first differences (in the latter) are employed as instruments. When ρ is large, GMM-DIF tends to perform poorly, because the lagged levels of Y_{it-1} are weak instruments. In a recent contribution, Andres *et al.* (2009) show that GMM-SYS performs better than GMM-DIF when applied to Fama and Babiak's (1968) extension of Lintner's (1956) partial adjustment model. Similar to Khan (2006) and Andres *et al.* (2009), I prefer the GMM-SYS to GMM-DIF for my analysis.

Unfortunately, as pointed out by Roodman (2009), the GMM-SYS has one main drawback. The use of too many instruments can weaken the Hansen (1982) test of over-identifying restrictions, leading to an undersized test. To reduce the issue of instrument proliferation, I employ the collapsing technique suggested by Roodman (2009). This technique employs one instrument for each endogenous variable and lag length (instead of one for each time period, endogenous variable, and lag length), considerably reducing the number of instruments. To test for the exogeneity of the instruments chosen, I report difference-in-Hansen tests for the subsets of instruments of each endogenous variable, separately for the equations in differences and in levels.

Section 3.2 defines the variables that constitute $\mathbf{x_{it}}$ and $\mathbf{c_{it}}$. Section 3.3 describes the data.

3.2. Definition of the explanatory variables

Table 1 defines the explanatory variables used in my econometric models. These can be divided into two groups: the main explanatory variables associated with the three hypotheses ($\mathbf{x_{it}}$ in equation (1)) and the control variables ($\mathbf{c_{it}}$ in equation (1)).

Risk-shifting hypothesis. I test the risk-shifting hypothesis (H_1) using the natural logarithm of the Z-score as a proxy for default risk. The banking literature commonly employs the Z-score as a measure of default risk (Boyd and Graham, 1988). Recent literature employs the natural logarithm of the Z-score because the former is highly skewed, while the latter is normally distributed (Laeven and Levine, 2009; Beck *et al.*, 2011; Schaeck *et al.*, 2011). I test H_1 by assessing the influence of the log of the Z-score on the dividend payout ratio. According to H_1, there should be a negative relation between the log of the Z-score and the payout ratio.[9]

Opportunity cost hypothesis. I test the opportunity cost hypothesis (H_2) by creating a dummy variable (*Undercapitalised Bank*) that takes on the value one if the ratio of equity to total assets

[9] As an alternative measure of bank risk, the extant literature widely employs the ratio of loan loss provisions to total loans (Nier and Baumann, 2006; Altunbas *et al.*, 2007). However, this measure reflects only a specific type of risk (credit risk) and suffers from two drawbacks. First, loan loss provisioning tends to be backward looking, because most banks do not recognise future loan losses in a timely manner (Beatty and Liao, 2009). Therefore, the loan loss provision ratio is at best a measure of ex post credit risk. Second, loan loss provisioning tends to be procyclical (Borio *et al.*, 2001; Beatty and Liao, 2009), and banks postpone provisioning for loan losses until the beginning of economic downturns (Laeven and Majnoni, 2003). Moreover, banks can manipulate the loan loss provision for purposes of income smoothing, although the empirical evidence is mixed (Collins *et al.*, 1995; Ahmed *et al.*, 1999). The literature on the dividend policies of non-financial firms employs measures of risk such as the standard deviation of residuals from a regression of daily stock returns on returns of the market portfolio (Hoberg and Prabhala, 2009). Other measures of risk are the standard deviation of stock returns or the residuals of a regression of excess returns on the three Fama–French (1992) factors.

is smaller than the sample median, and zero otherwise.[10] For banks with low capital ratios, dividends should be smaller than for banks with high capital ratios.[11]

Charter value hypothesis. The banking literature widely employs the ratio of customer deposits to total assets as a proxy for charter value (Marcus, 1984; James, 1991; Goyal, 2005; Schaeck *et al.*, 2011).[12] Customer deposits are a relatively stable and cheap source of funding for banks. Large ratios of customer deposits to total assets reduce the cost of capital and increase charter value (Schaeck *et al.*, 2011). To test H_3, I create a dummy variable (*Charter)* that takes on the value one if the ratio of customer deposits to total assets is larger than the sample median (charter value is high), and zero otherwise (charter value is low). For H_3 to hold, the coefficient of *Charter* should be negative.

Risk shifting may be counterbalanced by capital adequacy regulations and the desire to preserve the charter. The relation between default risk and dividends can therefore differ according to whether the capital ratio (or charter value) is high or low. To allow for this possibility, I include two interaction terms in my regressions: *Undercapitalised Bank* × *LnZ* and *Charter* × *LnZ.*

The coefficient of *Undercapitalised Bank* × *LnZ* measures the differential impact of default risk on dividends for banks with low capital ratios. The overall effect of default risk on dividends for banks with low capital ratios is measured by the sum of the coefficients of *LnZ* and the interaction term. A significantly negative coefficient for both *LnZ* (consistent with H_1) and the interaction term suggests that risk shifting is even *stronger* for banks with low capital ratios than for banks with high capital ratios. Conversely, a significantly positive coefficient for the interaction term when the coefficient of *LnZ* is significantly negative suggests that risk shifting is *weaker* for banks with low capital ratios. If the algebraic sum of the two coefficients is near zero, this suggests that there is no relation between risk and dividends for banks with low capital

[10] Using a dummy rather the continuous variable equity to total assets facilitates the interpretation of the interaction term with *LnZ* and reduces correlation with *LnZ* (which may increase standard errors in the multivariate regressions). The same applies to the dummy created to test my third hypothesis.

[11] However, capital requirements may not be effective in reducing risk taking. They can be circumvented by capital management (Collins *et al.*, 1995) and the use of hybrid instruments (Acharya *et al.*, 2011). Hybrid instruments are included in tier 2 of the regulatory capital required by the 1988 Basel Accord. Because they do not constitute equity in the sense of a residual claim of the shareholders, they imply higher risk for debt holders and incentivise leveraging and excessive risk taking on the part of bank owners. This phenomenon takes place because common equity represents a call option on the ownership of a bank whose exercise price is represented by the value of debt capital (Merton, 1974): If the value of assets is lower than that of liabilities, the value of the option (or common equity) is zero. Increasing the fraction of assets funded by capital other than common equity increases the exercise price to a point where the value of the option is close to zero. Owners of highly leveraged banks have nothing to lose and engage in excessive risk taking.

[12] An alternative proxy for charter value is Tobin's *q* (ratio of the market value of assets over the book value of assets). However, in the corporate finance literature, *q* is a measure of growth opportunities. Moreover, *q* cannot be calculated for unlisted banks.

ratios. The latter case would be consistent with the belief that risk shifting is counterbalanced by capital adequacy regulations.

The interaction term *Charter* × *LnZ* allows one to determine the differential impact of default risk on dividends when the charter value is high. A significantly negative coefficient for both *LnZ* (consistent with H_1) and the interaction term suggests that risk shifting is even *stronger* for banks with high charter values than for banks with low charter values. Conversely, a significantly positive coefficient for the interaction term when the coefficient of *LnZ* is significantly negative suggests that risk shifting is *weaker* for banks with high charter values. If the algebraic sum of the two coefficients is near zero, this suggests that there is no relation between risk and dividends for banks with high charter values. In the latter case, the propensity towards risk shifting is offset by the desire to preserve the charter.

Control variables. The existing literature about dividend policies in non-financial firms finds that the following variables can influence dividend policy: insider–outsider (IO) conflict (Easterbrook, 1984; Jensen, 1986; Faccio *et al.*, 2001;),[13] asset growth (Fama and French, 2001), size (Fama and French, 2001; DeAngelo *et al.*, 2004; Denis and Osobov, 2008), profitability (Fama and French, 2001; DeAngelo *et al.*, 2004; Denis and Osobov, 2008),[14] earned equity (DeAngelo *et al.*, 2006; von Eije and Megginson, 2006; DeAngelo and DeAngelo, 2007), a recent quotation on the stock market (Cornett *et al.*, 2008), and the legal framework of the country of origin (La Porta *et al*., 2000; Kinkki, 2008).[15] Accordingly, I include several control variables ($\mathbf{c}_{\mathbf{it}}$) to account for the impact of these factors: *Recorded Shareholders*, *Listed Bank*, and the dummy variables *IND1*, *IND2*, and *IND3* (related to the degree of independence from the main shareholder) for the IO conflict; *Loan Growth* for asset growth; *Size* (log of assets) for size; *Profitability* (ROA adjusted for loan loss provisions) for profitability; *Earned Equity* (retained earnings divided by total equity) for earned equity; *IPO* (which stands for *initial public offering*) for recent quotations; and the dummy variable *US* (that takes on the value one if

[13] Dividends help outsiders monitor insiders because they lead to more frequent equity issues, which imply market scrutiny (Easterbrook, 1984) and discourage the use of financial resources for empire building and perquisites (Jensen, 1986). However, dividends are not the only monitoring mechanisms available to outsiders. If other mechanisms exist, dividends can lose their monitoring function (Noronha *et al.*, 1996). This can occur when there is a large outside shareholder whose incentive to monitor insiders is high (Shleifer and Vishny, 1986) or when the interests of insiders and outsiders are aligned (e.g., in the presence of performance-related compensation packages for managers).

[14] To avoid multicollinearity, I exclude return on assets (ROA) from my regressions. Section 4.5 reports robustness tests after including ROA (both adjusted and unadjusted for earning management).

[15] According to the outcome model of agency theory (La Porta *et al.*, 2000), the legal framework under which the bank operates influences dividend policy. Banks in countries where there is strong protection for minority shareholders (typically countries whose legal system is based on common law) should pay larger dividends. Minority shareholders whose rights are inadequately protected may lack the necessary legal power to induce insiders to pay dividends. If the protection of minority shareholders' rights is stronger in the USA than in Europe, the outcome model predicts that the coefficients of the dummy should be positive.

a bank has its headquarters in the US, and zero otherwise) for the legal framework of the country of origin. Moreover, I include year dummies in the regressions to allow for changes in dividends due to changes in the macroeconomic environment over time.

[Insert Table 1 here]

3.3. Data

I collect consolidated bank account data for 746 banks (bank holding companies, hereafter BHCs; commercial banks; cooperative banks; and savings banks) located in either the USA or the European Union, hereafter EU (27 countries), from the Bureau Van Dijk Bankscope database. The sample period runs from 2000 to 2007 (although for the computation of *LnZ* I use even data for 1999 and 2008). Table 2 summarises the construction of the sample.

[Insert Table 2 here]

Table 3 reports the sample composition and descriptive statistics for the main variables, as well as the main statistics for the variables that are employed to calculate my proxy for default risk (*LnZ*): *SDROA* (standard deviation of the ROA), *Capital Ratio*, and *Profitability*. The majority of the banks in the sample are BHCs (52%), followed by commercial banks (38%). Most of the banks are located in the USA (59%). The majority of the US sub-sample consists of BHCs (81%, but only 10% for the EU), while the majority of the EU sub-sample comprises commercial banks (65%, but only 18% for the USA). There are only three mutual banks for the USA (0.1%) and 77 for the EU (25%). Most of the sample consists of banks that were listed in at least one of the years comprising the sample period (53%). Around 77% of the observations pertain to US banks, and around 59% of them pertain to listed banks.

US banks have, on average, the same payout ratio as EU banks. There is no significant difference between the payout ratios of listed and unlisted banks. US banks tend to be less risky than EU banks in terms of *LnZ* and *SDROA*, and they have a higher average *Capital Ratio* (ratio of equity to total assets). Consistent with this latter finding, the mean for the dummy variable *Undercapitalised Bank* is lower for US banks than for EU banks.

US banks are, on average, more profitable than EU banks. Listed banks exhibit, on average, higher *LnZ* and lower *SDROA* than unlisted banks, although the average *Capital Ratio* and *Profitability* tend to be lower than for unlisted banks. The median *Capital Ratio*, however, is higher for listed banks than for unlisted banks, and *Undercapitalised Bank* is, on average, lower for listed than for unlisted banks. *Charter* is, on average, larger for US banks than for EU banks and it is, on average, larger for listed banks than for unlisted banks.

Table 3 also reports the descriptive statistics for the continuous control variables *Loan Growth*, *Earned Equity*, and *Size*. The EU banks exhibit an annual loan growth almost twice that of US banks. US banks have, on average, higher *Earned Equity* than EU banks. US banks are, on average, smaller than EU banks, and listed banks are, on average, smaller than unlisted banks. This latter result may be due to the positive correlation between the bank's country of origin and the decision to go public. Around 82% of the listed banks in my sample are from the USA, suggesting that US banks are more inclined to go public than EU banks. Banks in the US sub-sample are, on average, smaller than those in the EU sub-sample, and this may lead to the negative correlation between quotation and size.

[Insert Table 3 here]

Table 4 reports the Pearson correlation coefficients for the dependent and continuous explanatory variables, including the variables that make up *LnZ* (*Capital Ratio*, *SDROA*, and *Profitability*). The first lag of *DP* (*DP*(-1)) is related to several explanatory variables. For this reason, excluding it from my specifications can result in omitted variable bias.

Consistent with a risk-shifting hypothesis, *DP* is negatively correlated with *LnZ* and positively correlated with *SDROA*. There is a negative relation between *DP* and *Charter* and between *DP* and *Loan Growth*. This suggests that banks with investment opportunities tend to retain larger portions of their earnings. Consistent with previous studies on the dividend policies of non-financial firms, *DP* is positively correlated to *Earned Equity*, *Profitability*, and *Size*.

The relations between the explanatory variables are also consistent with expectations. The variable *LnZ* is positively correlated with *Capital Ratio* and negatively correlated with *SDROA* and *Undercapitalised Bank*. Banks with higher charter value tend to exhibit higher *LnZ* values, suggesting a negative relation between charter value and default risk. This result supports the hypothesis that banks with high charter values have an incentive to avoid liquidation. *Charter* is negatively related to *Undercapitalised Bank*, suggesting that banks with high capital ratios tend to have high charter values. Because I use the ratio of customer deposits to total assets to construct the dummy *Charter*, this result suggests that banks that can rely on a large customer deposit base (i.e., a relatively cheap source of funds) can afford to raise large amounts of equity capital.

Large banks have, on average, lower *LnZ* values than small banks, probably because they are more likely to benefit from government bailouts in case of financial distress (see O'Hara and Shaw, 1990). *Capital Ratio* and *SDROA* are positively correlated, which may be a consequence of capital adequacy regulations (banks with low asset quality are expected to hold more capital). Small banks tend to hold more capital than large banks, consistent with Ayuso *et al.* (2004) and Flannery and Rangan (2008). A negative relation between size and the capital ratio has been ascribed to the benefits of diversification (which large banks can exploit better than small banks) and to the fact that large banks can raise new capital on the market (e.g., wholesale debt market) more easily than small banks. Not only do small banks hold more capital as a percentage of total assets, but they also exhibit lower ROA volatility, and as a result their Z-scores are also larger on average. Finally, *Profitability*, *Capital Ratio*, and *Earned Equity* are positive related. This result supports the pecking order theory of finance, which posits that more profitable banks can improve their capital ratio by retaining more earnings (Nier and Baumann, 2006).

[Insert Table 4 here]

4. Results

This section presents the main results of my empirical analysis and robustness checks. Section 4.1 reports the main results of the regressions. Section 4.2 reports the results after the winsorisation of the variables. Section 4.3 reports the results of piecewise linear regressions to examine the relation between default risk and payout ratios for different levels of default risk. Section 4.4 reports the results of regressions that allow for the effects of capital requirements by considering the level of the regulatory capital ratio rather than the ratio of equity to total assets. Section 4.5 reports further robustness tests.

4.1. Main results

This section presents the main results of the OLS, FEM, and GMM-SYS regressions. First, I run the OLS, FEM, and GMM-SYS models with *LnZ* as the main explanatory variable (I test only H_1). Second, I test H_1 and H_2 by including in the regressions the dummy variable *Undercapitalised Bank* and the interaction term *Undercapitalised Bank* × *LnZ*. Third, I test H_1 and H_3 by including in the regressions the dummy variable *Charter* and the interaction term *Charter* × *LnZ*. Finally, I include *LnZ*, *Undercapitalised Bank*, *Charter*, and the respective interaction terms to test H_1, H_2, and H_3 in the same regressions.

Table 5 reports estimation results for the OLS, FEM, and GMM-SYS models.[16] In the GMM-SYS specifications, I allow for endogeneity with respect to both *DP*(-1) and *LnZ* using internal instruments. I employ the difference-in-Hansen test to test the exogeneity of the instruments for both *DP*(-1) and *LnZ*.[17]

Because some of the control variables may be predetermined (e.g., current shocks in the Gross Domestic Product can impinge on future loan growth), using instruments in differences for the transformed equations can lead to endogeneity. For this reason, I use only instruments in the level equations for the control variables.

The diagnostic statistics for GMM-SYS are consistent with the assumptions of this econometric model. In particular, the coefficients for second-order autocorrelation in the first-differenced residuals are insignificant. The difference-in-Hansen tests of exogeneity support the validity of all subsets of instruments. The number of instruments (which range between 31 for specification GMM1 and 34 for specifications GMM3 and GMM4) is very low with respect to the number of groups (746), and therefore the issue of instrument proliferation should not undermine the validity of my results.[18]

In line with theory (Bond, 2002), the coefficient for the first lag of *DP* for the GMM-SYS specifications lies between the corresponding coefficients for the OLS and FEM specifications. The coefficients of the other variables needed to test H_1, H_2, and H_3 change according to the econometric model employed, suggesting that employing OLS or FEM can lead to erroneous conclusions.

For OLS1, FEM1, and GMM1, the coefficients of *LnZ* are negative and significant, supporting H_1. However, as said before, due to potential endogeneity, one should use caution when making inferences on the sign and significance of the coefficients of *LnZ*. Moreover, the interaction between default risk, capital requirements, and charter values can suggest that the relation

[16] Each model is run according to 12 different specifications, for a total of 36 specifications. To avoid multicollinearity, the regressions are run separately for each of the three proxies for the IO conflict. There are 12 specifications for each proxy for the IO conflict. Throughout Section 4, I report the results for the 12 regressions that use the dummy *Listed Bank* as a proxy for the IO conflict. This is done for the sake of exposition and to preserve space. For the same reason, the coefficients of the control variables are not included in Table 5. However, the main results are virtually the same for all of the specifications, and all results are available upon request.

[17] To test whether my instruments satisfy the relevance principle, I proceed as follows. First, I construct my collapsed instruments on Stata using the lag (L.) and difference (D.) operators, substituting with zeros the missing values. Then I employ the command ivreg2 separately for the differenced and level equations, as described in Roodman (2006). For the differenced equations, all tests for under-identification and weak identification reject the null hypothesis at the 1% level, suggesting that my instruments are well correlated with the endogenous variables. For the level equations, Kleibergen–Paap (2006) statistics suggest that the instruments for *DP*(-1) are weak. However, including or excluding these instruments from the regressions does not substantially change my results (see Section 4.5).

[18] A rule of thumb to avoid the problem of instrument proliferation is to keep $j < N$, where j is the number of instruments and N is the number of groups.

between default risk and payout ratios can change according to the capital ratio and a bank's charter value.

For OLS2, FEM2, and GMM2, the coefficients of *LnZ* are still negative and significant (only at the 10% level for FEM2). However, for GMM2 (the specification that should be preferred), the coefficients of *Undercapitalised Bank* are negative and significant, while the coefficient of the interaction term between *Undercapitalised Bank* and *LnZ* is positive and significant. The former results suggest that undercapitalised banks tend to have lower payout ratios with respect to well-capitalised banks, consistent with H_2. The latter result suggests that for undercapitalised banks the relation between default risk and payout ratios is insignificant (-0.1400 + 0.1357 = -0.0043). Therefore, these results suggest that capital requirements do reduce moral hazard for banks with low capital ratios.

For OLS3, FEM3, and GMM3, the coefficient of *LnZ* is still negative, and for GMM3 it is also weakly significant. This result supports H_1. However, for GMM3 the coefficient of *Charter* is negative and weakly significant, supporting H_3. The coefficient of the interaction term *Charter* $\times$ *LnZ* (also weakly significant) suggests that for banks with high charter value, the relation between default risk and payout ratios is insignificant (-0.1312 + 0.1285 = -0.0027). Therefore, these results suggest that the desire to preserve the charter offsets the propensity to risk shifting when the charter value is high.

Finally, the results for OLS4, FEM4, and GMM4 confirm those of the other specifications, although the significance of the coefficients tends to weaken, most likely due to multicollinearity (as shown in Table 4, the dummy variables *Undercapitalised Bank* and *Charter* are negatively correlated). The coefficients of the main explanatory variables for OLS4 and FEM4 are insignificant or weakly significant. In particular, we have the following:

- The coefficient of *LnZ* is negative but insignificant;

- The coefficient of *Undercapitalised Bank* is negative and weakly significant;

- The coefficient of *Undercapitalised Bank* $\times$ *LnZ* is positive but insignificant;

- The coefficient of *Charter* is negative and weakly significant;

- The coefficient of *Charter* $\times$ *LnZ* is positive but insignificant.

Multicollinearity results in lower F-statistics for the OLS and FEM specifications where *LnZ* is not the only main explanatory variable. For instance, for OLS2 (OLS3) the F-statistic is 8.208

(8.506), while for OLS1 it is 9.233. The lowest F-statistic is obtained for OLS4 (7.640). The average variance inflation factor for OLS1 is 1.77, while that for OLS4 is 5.72. In particular, the variance inflation factor for *Undercapitalised Bank* and *Charter* are 19.21 and 19.71, respectively, confirming the existence of multicollinearity.[19]

For the GMM specifications, the results suggest that the explanatory power of the proxies for capital adequacy regulation is not negligible. The χ^2-statistic increases considerably (from 44.15 to 59.88) when *Undercapitalised Bank* and the interaction term Undercapitalised Bank$\times$*LnZ* are included in the regressions (in GMM2). Conversely, the increase in the χ^2-statistic resulting from the inclusion of *Charter* and *Charter*$\times$*LnZ* in GMM4 is very small (from 59.88 to 60.12).

Overall, these results suggest that, when *LnZ* is the only main explanatory variable included in the regressions, default risk is positively related to payout ratios. However, banks with low capital ratios tend to distribute fewer dividends than banks with high capital ratios. The results for the interaction terms suggest that for banks with low capital ratios the relation between default risk and payout ratios is insignificant. Therefore, capital adequacy regulations reduce potential moral hazard deriving from expectations of future bailouts. The results regarding the impact of charter values are weaker, but they are consistent with the view that banks with high charter values are less inclined to pay dividends and the relation between default risk and payout ratios is insignificant when charter value is high.

The results for the control variables (unreported but available upon request) suggest that *Loan Growth* tends to be negatively related to *DP* and *Earned Equity* tends to be positively related to *DP*, consistent with the results reported in the literature on non-financial firms. The results for *Size* are negative and weakly significant for FEM1 and FEM2. This result is contrary to that found by previous studies on the dividend policies of non-financial firms. However, this result may be due to a positive correlation between *Size* and *DP*(-1), as shown in Table 4, coupled with the well-known downward bias of the FEM estimator for ρ. For the OLS and GMM specifications, the coefficient of *Size* is always insignificant, consistent with the results reported in Table 4. Finally, the results for *IPO* suggest that on the first year of their listing, banks tend to *decrease* payout ratios. This result may suggest that, while IPO banks may be more likely to initiate dividends than other listed banks, their average payout ratio may be smaller than that of older (even if unlisted) banks. The results for the other control variables are insignificant.

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[19] For the OLS specifications, an incremental F-test for OLS4 (unrestricted model) and OLS1 (restricted model) results in $F(4, 2944) = 1.6359$, with a p-value equal to 0.1624. The calculations are available upon request from the author.

[insert table 5 here]

4.2. The impact of extreme observations

To understand whether my results have been driven by outliers, I repeat the analysis after winsorisation of all continuous variables at the first and 99th percentile. The results are reported in Table 6. While there is a serious increase (over 80%) in ρ (the coefficient for the lagged dependent variable) for all of the OLS specifications, the coefficients obtained using GMM-SYS lie between the estimates produced by the OLS and FEM, suggesting that the GMM-SYS estimator for ρ is consistent. The diagnostic tests suggest that there is no second-order autocorrelation in the residuals. The difference-in-Hansen test suggests that the instruments chosen are valid.[20]

The results for the GMM-SYS models mirror those reported in Table 5, although the magnitude of the coefficients decreases and the overall significance of the regressions improves (as shown by the F- and Wald statistics). Similar to Table 5, the decreased significance of the coefficients for the regressions including all of the main explanatory variables suggests the presence of multicollinearity. In particular, the χ^2-statistic for GMM4 (92.83) is *lower* than that for GMM2 (93.38), suggesting that the incremental explanatory power of *Charter* and *Charter*×*LnZ* is negligible.

[insert table 6 here]

4.3. Re-assessing the risk-shifting hypothesis: What happens when the incentive to gamble is strongest?

The former analysis may not be able to uncover the true relation between default risk and payout ratios just for the cases that are most interesting from a regulatory perspective: when default risk is high and risk-shifting incentives may be strongest. In particular, while the foregoing regressions consider the *average* impact of default risk on payout ratios (allowing for heterogeneity in charter values and capital ratios), it may be useful to test the risk-shifting hypothesis considering the relation between default risk and payout ratios for different levels of default risk. To this end, I employ piecewise linear regression analysis to examine whether the slope coefficient of *LnZ* changes for different percentiles of the distribution of *LnZ*.

I employ two specifications with linear splines comprising three segments. The first specification considers two knots at the fifth and 50th percentile of the distribution of *LnZ*. For

[20] Except for the instruments for *DP*(-1) in the level equations for GMM4, for which the p-value is 0.073.

the second specification the knots are at the 10th and 50th percentile of the distribution of *LnZ*. For convenience, the fifth, 10th, and 50th percentiles of *LnZ* are denoted $LnZ_{.05}$, $LnZ_{.10}$, and $LnZ_{.50}$, respectively. For the first specification, the three new variables are denoted as follows:

$$\ln Z_1 = \ln Z \quad \text{for} \quad \ln Z \le \ln Z_{.05} \quad \text{and} \quad \ln Z_1 = \ln Z_{.05} \quad \text{otherwise}$$

$$\ln Z_2 = \begin{cases} 0 & \text{for} \quad \ln Z \le \ln Z_{.05} \\ \ln Z - \ln Z_{.05} & \text{for} \quad \ln Z_{.05} < \ln Z \le \ln Z_{.50} \\ \ln Z_{.50} - \ln Z_{.05} & \text{otherwise} \end{cases}$$

$$\ln Z_3 = \begin{cases} 0 & \text{for} \quad \ln Z \le \ln Z_{.50} \\ \ln Z - \ln Z_{.50} & \text{otherwise} \end{cases}$$

For the second specification, the variable LnZ_3 is the same, while the variables LnZ_1 and LnZ_2 are defined as above after replacing $LnZ_{.05}$ with $LnZ_{.10}$.

I construct interaction terms between the new variables and the dummy variables *Undercapitalised Bank* and [1 – *Charter*]. The latter variable is preferred to *Charter* to evaluate the impact of different levels of default risk when the incentive to gamble is stronger (the charter value is low).

The average *LnZ* for the 148 bank–year observations for which $LnZ < LnZ_{.05}$ is 1.8712, which corresponds to an average Z-score of 6.4961. This value is 10 times smaller than the average Z-score of the whole sample (65.27) and implies that these banks are, on average, only 6.5 standard deviations of ROA from insolvency. For $LnZ < LnZ_{.10}$ the average *LnZ* is 2.2845, equivalent to an average Z-score of 9.8208. Such low Z-scores are mainly related to very high *SDROA* values. The average *SDROA* for $LnZ < LnZ_{.05}$ is 0.0223, almost 10 times as large as the average *SDROA* for the whole sample (0.0030, see Table 3). The average *SDROA* for $LnZ < LnZ_{.10}$ is 0.0145, almost five times as large as for the whole sample.[21]

As a first indication of the relation between default risk and the payout ratios, Figure 1 shows the average payout ratios for different levels of default risk. Overall, there is a positive relation between default risk and the payout ratio. However, for very high levels of default risk, the relation appears to become negative: The average *DP* for $LnZ < LnZ_{.05}$ and $LnZ < LnZ_{.10}$ is 50.86% and 54.17%, respectively.

[21] However, low equity to total assets ratios and large losses are also driving the Z-score down. For example, the Royal Bank of Scotland Plc recorded a loss in 2008 of 35 billion GBP (around 50 billion USD) and *Capital Ratio* was 3.35%, less than half the average *Capital Ratio* for the EU sub-sample (7.65%). In the same year Deutsche Bank AG recorded a loss of around 3.9 billion euros (around 5.4 billion USD) and *Capital Ratio* was 1.45%. Such extreme cases are not limited to the recent global financial crisis. For instance, Commerzbank AG recorded a loss in 2003 of 2.2 billion euros (around 2.6 billion USD) and *Capital Ratio* was 3.03%.

[insert figure 1 here]

The results of the piecewise regressions are reported in Table 7. To preserve space, I report only the four GMM specifications. Table 7a) reports the results for the regressions with knots at $LnZ_{.05}$ and $LnZ_{.50}$. Contrary to the risk-shifting hypothesis, the coefficient of LnZ_1 is insignificant for all four specifications. The coefficient of LnZ_2 is negative and significant for all of the specifications, and the coefficient of LnZ_3 is positive and weakly significant for GMM3 and positive and significant for GMM4. These results do not support the risk-shifting hypothesis, since for the riskiest banks default risk and payout ratios are not correlated. The coefficients of *Undercapitalised Bank* and [1 – *Charter*] are insignificant. This may be due to the increased number of explanatory variables presenting multicollinearity.

The coefficients of *Undercapitalised Bank* × LnZ_2 are significantly positive. The overall impact of *LnZ* on payout ratios for undercapitalised banks when $LnZ_{.05} < LnZ \leq LnZ_{.50}$ is negligible for GMM2 (-0.3479 + 0.3354 = -0.0125) and negative for GMM4 (-0.4360 + 0.2722 = -0.1638). The latter result provides some support for a positive relation between default risk and payout ratios, but is far from providing conclusive evidence on the risk-shifting hypothesis.

The coefficients of [1 – *Charter*] × LnZ_2 are significantly positive. For banks with low charter values and $LnZ_{.05} < LnZ \leq LnZ_{.50}$ the relation between *LnZ* and payout ratios is insignificant for GMM2 (-0.2592 + 0.2457 = -0.0135) and negative for GMM4 (-0.4360 + 0.2539 = -0.1821). Similar to the results for *Undercapitalised Bank* × LnZ_2, this constitutes weak evidence of risk-shifting behaviour, since the banks considered do not carry very high default risk. The coefficients of [1 – *Charter*] × LnZ_3 are significantly negative. For banks with low charter values and $LnZ > LnZ_{.50}$ the relation between *LnZ* and payout ratios is negligible for both GMM2 (0.0583 - 0.0879 = -0.0296) and GMM4 (0.0971 - 0.0868 = 0.0103).

Table 7b) reports the results for the regressions with knots at $LnZ_{.10}$ and $LnZ_{.50}$. The results are similar to those reported in Table 7a), although the significance of the coefficients decreases.

[Insert tables 7a,b here]

4.4. Regulatory capital and effects on dividends

Capital requirements are not the only variable that can reduce dividend payments when the equity to total assets ratio becomes smaller. The incentive to reduce dividend payments for banks with thinner capital buffers may also be due to the probability of having to forgo investment opportunities in the future because of debt overhang issues (Myers, 1977): Unless undercapitalised banks beef up equity reserves by reducing the payout ratio, debt holders may be reluctant to finance new projects.

To provide further insights on this issue and to better capture the effects of capital requirements on dividends, I repeat the analysis considering the total regulatory capital ratio (total regulatory capital divided by risk-weighted assets under Basel rules) and the tier 1 ratio (tier 1 capital divided by risk-weighted assets under Basel rules). Banks with low regulatory capital should have lower payout ratios because of a higher probability of future regulatory intervention triggered by lack of compliance with capital adequacy regulations.

Only three banks in my sample fall below the limit of 8% for the total regulatory capital ratio in one or more years. Two of these banks also fall below the limit of 4% for the tier 1 capital ratio.[22] Among these three banks, only Rolo Banca 1473 (an Italian commercial bank) paid dividends when its total regulatory capital ratio was below 8% (but the tier 1 ratio was above 4%). The other two banks (US BHCs) did not pay dividends, probably because of the existence of a prompt corrective action framework in the USA, currently not available in Europe (European Shadow Financial Regulatory Committee, 2006).[23] In particular, Rolo Banca 1473 paid dividends equal to 76% of its net income in 2000, when its total regulatory capital ratio was 7.6% and the tier 1 ratio was 6.8%. In 2001, despite a decrease in the total regulatory capital ratio (6.7%), Rolo Banca 1473 distributed 95% of its net income to its shareholders. The rest of the sample exhibits wide heterogeneity in the amount of tier 1 and total regulatory capital held as a percentage of risk-weighted assets. The average tier 1 ratio (total regulatory capital ratio) is around 12% (14%), while the standard deviation is 5.9% (6.2%). The fact that many banks hold a large amount of discretionary capital is not surprising and is consistent with previous literature (Gropp and Heider, 2010; Schaeck and Čihák, 2010; Allen *et al.*, 2011).

Gropp and Heider (2010) investigate the impact of being close to the regulatory minimum for tier 1 (below 5% or below 6%) on book leverage and find that 'riskier banks that are close to the regulatory minimum do not adjust their capital structure towards more equity'(p. 614). In a similar vein, I investigate the impact of being close to the regulatory minimum for the dividend policy of a bank. I create a dummy (Close) equal to one if either the tier 1 ratio of the previous year is below 6% or the total regulatory capital ratio (tier 1 ratio plus tier 2 ratio) of the previous

[22] The banks with a total regulatory capital ratio lower than 8% are Taunus Corporation (BHC, US) for the period 2002–2006, BancWest Corporation (BHC, US) for the period 2002–2007, and Rolo Banca 1473 SPA (commercial bank, Italy) in 2000. The first two also exhibit a tier 1 ratio lower than 4% (Taunus Corporation from 2002 to 2006 and BancWest Corporation in the years 2002, 2003, and 2005).

[23] Nieto and Wall (2007) examine the pre-conditions for successful implementation of a prompt corrective action framework in the EU.

year is below 10%, and zero otherwise. For the 98 cases for which Close = 1, the average *DP* is 25.92% (median = 23.86%). For the 2866 cases for which Close = 0, the average *DP* is 40.90% (median = 33.02%). This is a first indication that banks close to the minimum regulatory requirements do tend to have, on average, a lower payout ratio than banks further from the minimum regulatory requirements.

Table 8 reports the results of the regressions where the dummy *Undercapitalised Bank* is replaced by the dummy Close (OLS2 and OLS4, FEM2 and FEM4, GMM2 and GMM4). For the preferred specifications (GMM2 and GMM4), the coefficients of Close and the interaction term Close $\times$ *LnZ* are significant. Similar to the findings reported in Tables 5 and 6, banks with low regulatory capital ratios tend to distribute fewer dividends. Overall, the impact of default risk on payout ratios for banks with low regulatory capital ratios is negligible. For GMM4 the coefficient of *Charter* is negative and significant, and that of *Charter* $\times$ *LnZ* is positive and weakly significant. By comparing the results for GMM4 reported in Table 8 with those reported in Table 5, it can be seen that replacing *Undercapitalised Bank* with Close improves the significance of the coefficients of the main explanatory variables. These results may suggest that banks tend to be more sensitive to capital requirements when they are close to the regulatory minimum. To improve robustness, I run the regressions after winsorisation of all continuous variables at the first and 99th percentiles. In unreported results (available upon request from the author) I find that the coefficients of Close and Close $\times$ *LnZ* maintain their sign and significance. The sign and significance of the coefficients of *LnZ* are the same as those reported in Table 8. The sign of the coefficients of *Charter* and *Charter* $\times$ *LnZ* are the same as those reported in Table 8, but the coefficients of *Charter* are weakly significant and those of *Charter* $\times$ *LnZ* are insignificant.

[Insert table 8 here]

4.5. Other robustness tests

Additional robustness tests show that my results hold even for different specifications of the original regressions (whose main results are reported in Table 5).

First, I run all of the original regressions after replacing the proxy for profitability. Instead of using ROA adjusted for loan loss provisions to calculate *LnZ*, I employ the unadjusted ROA. The results are virtually the same as those reported in Table 5. Therefore, my results are robust to changes in the proxy for profitability to allow for practices of earnings management.

Second, I run the four GMM-SYS regressions without the instruments for the endogenous variables *DP*(-1) for the level equations, which appear to be weak (see footnote 17). My results remain virtually the same, although the coefficients of *LnZ*, and the interaction term *Undercapitalised Bank* × *LnZ* become weakly significant (in Table 5 they are insignificant).

Finally, to ensure that the effects of *LnZ* are correctly captured and do not simply capture the effect of profitability (which is positively related to *SDROA*), I run all of the original regressions after including *Profitability* (using either the unadjusted ROA or the ROA adjusted for earnings management) as an additional control variable. The results for the main explanatory variables remain virtually the same as those reported in Table 5.

5. Extensions

This section provides further insights regarding the risk-shifting hypothesis. Section 5.1 investigates whether bank managers increase dividends deliberately when they know the bank is very close to default. Section 5.2 examines the effect of losses on the dividend policy of US banks during 2007–2009.

5.1. Further investigation of the endogeneity issue: Do banks increase dividends when default risk is highest?

Previous sections allow for the endogeneity of default risk using internal instruments. In this section, I use a different approach: I investigate dividend changes following years for which default risk is very high. To corroborate the validity of *LnZ* as a proxy for risk, I also investigate the relation between *LnZ* and volatility of stock returns for a subset of listed banks. The volatility of stock returns may proxy for cash flow uncertainty (Chay and Suh, 2009). It is reasonable to expect that default risk and cash flow uncertainty are positively correlated.

Since dividend payments tend to be constant over time (Lintner, 1956), a positive relation between payout ratios and default risk may be due to changes in earnings rather than changes in dividends. Thus, considering dividend changes, rather than payout ratios, may provide further insights on the existence of risk shifting. Moreover, very high default risk is arguably an extraordinary condition, exogenous to the decision-making process of bank managers. Therefore, considering the impact of very high default risk on dividend changes also addresses endogeneity concerns.

When default risk is very high, banks have a strong incentive to transfer risk using dividends. Therefore, when default risk is very high, dividend changes should become larger (if positive) than during periods of 'normal' default risk. If dividend changes become smaller or negative during periods of very high default risk, H_1 is rejected. This research strategy allows one to answer the following research question: Do bank managers intentionally increase dividends when they know their bank is very close to default?

Dividend changes for large banks are likely to be significantly larger than for small banks. For this reason, I consider percentage changes, $\Delta Div_{it} = (Div_{it} - Div_{it-1})/Div_{it-1}$, instead of first differences. To test the impact of very high default risk (defined as cases for which *LnZ* is lower than the 10th percentile) on ΔDiv_{it}, I implement a two-sample t-test with unequal variances, for which the null and alternative hypotheses are, respectively, as follows.[24]

Test #1. Effect of very high default risk on dividend changes

H_N: [Average ΔDiv_{it} if $LnZ_{it-1} \geq LnZ_{.10}$] = [Average ΔDiv_{it} if $LnZ_{it-1} < LnZ_{.10}$]

H_A: [Average ΔDiv_{it} if $LnZ_{it-1} \geq LnZ_{.10}$] $\neq$ [Average ΔDiv_{it} if $LnZ_{it-1} < LnZ_{.10}$]

I consider the impact of risk in the previous quarter (LnZ_{it-1}) on current changes in dividends (ΔDiv_{it}) to reduce endogeneity due to reverse causality. Since bank managers should be discouraged from cutting dividends in the absence of specific regulatory interventions, if H_N is true, there is no evidence of risk shifting. There are two possible results consistent with H_A:

[Average ΔDiv_{it} if $LnZ_{it-1} \geq LnZ_{.10}$] > [Average ΔDiv_{it} if $LnZ_{it-1} < LnZ_{.10}$] and

[Average ΔDiv_{it} if $LnZ_{it-1} \geq LnZ_{.10}$] < [Average ΔDiv_{it} if $LnZ_{it-1} < LnZ_{.10}$]

The former case is clearly inconsistent with the risk-shifting hypothesis, since it implies that banks tend to have a more conservative dividend policy when their default risk is very high. On the contrary, the latter case suggests that banks are inclined to increase dividends when default risk is very high, consistent with the risk-shifting hypothesis.

A second test investigates the impact of charter value on changes in dividends when default risk is very high.

[24] I denote the null hypothesis H_N and the alternative hypothesis H_A (rather than the customary H_0 and H_1) to avoid confusion with the notation for the main hypothesis tested in the paper (where H_1 denotes the risk-shifting hypothesis).

Test #2. Effect of charter value on dividend changes when default risk is high

For $LnZ_{it-1} < LnZ_{.10}$

H_N: [Average ΔDiv_{it} if $Charter_{it} = 0$] = [Average ΔDiv_{it} if $Charter_{it} = 1$]

where *Charter* = 0 (*Charter* = 1) indicates low (high) charter value. Since the main reason bank managers tend to avoid dividend cuts is a consequent drop in share price (Bessler and Nohel, 1996), it is useful to investigate the impact of very high default risk on dividends with respect to listed banks only. Accordingly, I implement the tests above with respect to 67 listed banks for which *LnZ* is lower than the 10th percentile for at least one year during 2000–2008. I collect daily (closing) prices from Thomson One Analytics for the period from 3 January 2000 to 31 December 2008.[25] Then I calculate the monthly standard deviation of log returns (defined as the log price of day *t* minus the log price of day *t* – 1) for each bank and each year.

First, I investigate whether very high default risk as measured by the accounting-based Z-score influences the volatility of stock returns (*Vol*). Very high default risk should increase the volatility of stock returns. Therefore, this test allows me to investigate the extent to which *LnZ* provides a valid measure of bank risk.

Test #3. Effect of very high default risk on changes in volatility

H_N: [Average ΔVol_{it} if $LnZ_{it-1} \geq LnZ_{.10}$] = [Average ΔVol_{t} if $LnZ_{it-1} < LnZ_{.10}$][26]

Second, similar to the tests on the whole sample, I test the effect of very high default risk on dividend changes (Test #1), and, for cases for which default risk is very high, the effect of charter value on dividend changes (Test#2).

Finally, I carry out two further tests on the impact of very high default risk and high charter value for observations for which the volatility of stock returns has increased.

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[25] In total, there are 88 listed banks for which $LnZ < LnZ_{.10}$. For 21 of these, there are no available stock price data in Thomson.

[26] I consider the volatility of returns in first differences (ΔVol_{it}) instead of levels (Vol_{it}) to allow for the fact that certain stocks may be more volatile than others due to liquidity rather than default risk. However, when I repeat Test #3 considering Vol_{it}, my results are still the same.

Test #4. Effect of very high default risk on dividend changes when the volatility of returns increases

For $\Delta Vol_{it} > 0$

H_N: [Average ΔDiv_{it} if $LnZ_{it-1} \geq LnZ_{.10}$] = [Average ΔDiv_{it} if $LnZ_{it-1} < LnZ_{.10}$]

Test #5. Effect of charter value on dividend changes when default risk is very high and the volatility of returns increases

For $LnZ_{it-1} < LnZ_{.10}$ *and* $\Delta Vol_t > 0$

H_N: [Average ΔDiv_{it} if and $Charter_{it} = 0$] = [Average ΔDiv_{it} if and $Charter_{it} = 1$]

Table 9 reports the results of the tests above. Table 9 is divided into two main sections: The first reports the results for the whole sample and the second reports the results for a sub-sample of listed banks. Each section is divided into two sub-sections: The first reports the results for the impact of very high default risk on dividends (and on the volatility of stock returns, for the sub-sample of listed banks); the second reports the results considering only cases for which $LnZ_{it-1} < LnZ_{.10}$ and investigates the impact of heterogeneity in charter values on dividends.

The results for Tests #1 and #4 provide evidence contrary to the risk-shifting hypothesis, for both the whole sample and the sub-sample of listed banks. The results for Tests #2 and #5 are insignificant, suggesting that charter value does not have an impact on dividend changes when default risk is very high. The results for Test #3 confirm that very high default risk results in larger increases in *Vol*, corroborating the validity of *LnZ* as a proxy for default risk.

In particular, for the whole sample, the average ΔDiv_{it} for $LnZ_{it-1} < LnZ_{.10}$ (7.01%) is significantly smaller than for $LnZ_{it-1} \geq LnZ_{.10}$ (58.12%). This suggests that banks assume a more conservative dividend policy when they are very close to default. However, a positive average ΔDiv_{it}, even for cases for which $LnZ_{it-1} < LnZ_{.10,}$ suggests that dividend payments can increase even when default risk is very high.

For the sub-sample of listed banks, the average ΔDiv_{it} is -6.46% for $LnZ_{it-1} < LnZ_{.10}$ and 19.27% for $LnZ_{it-1} \geq LnZ_{.10}$, respectively. Very high default risk is followed, on average, by a significant increase in Vol (0.05% for $LnZ_{it-1} \geq LnZ_{.10}$ and 1.24% for $LnZ_{it-1} < LnZ_{.10}$). The latter result supports the validity of *LnZ* as a proxy for default risk. For cases for which $\Delta Vol_{it} > 0$, the average ΔDiv_{it} is 22.19% for $LnZ_{it-1} \geq LnZ_{.10}$ and -17.43% for $LnZ_{it-1} < LnZ_{.10}$.

The results for the listed banks suggest that very high default risk leads (on average) to dividend cuts. The impact of very high default risk is stronger for cases for which there is also an increase in the volatility of returns. These findings reject the risk-shifting hypothesis, given the reluctance of listed banks to cut dividends to avoid price drops (Lintner, 1956; Bessler and Nohel, 1996).

The results regarding the effect of charter value are as follows.

- For the whole sample, the average ΔDiv_{it} for $LnZ_{it-1} < LnZ_{.10}$ is 12.96% for when the charter value is low (Low Charter in Table 9) and -7.17% for when the charter value is high (High Charter in Table 9). However, the difference in the two averages is insignificant, and therefore this finding cannot be interpreted as evidence supporting the charter value hypothesis;

- For the sub-sample of 67 banks, the results are also insignificant, regardless of whether the impact of the volatility of stock returns is allowed for or not.

[Insert table 9 here]

5.2. The 2007–2009 financial crisis: Dividends, risk, and charter value

Acharya *et al.* (2011) examine, among other things, the dynamics of the dividend payments of 23 large international banks over the period 2007–2009.[27] They find that while investment banks continued to pay large dividends during this period, deposit institutions 'cut their dividends drastically in the quarters leading up to their failure' (Acharya *et al.*, 2011, p. 7). The authors ascribe this difference to the prompt corrective action regime, which involves deposit institutions but not investment banks, such as Lehman Brothers (Acharya *et al.*, 2011). Acharya *et al.* (2011) also investigate dividend payments in the face of losses and find cases where banks paid large dividends after (or just before) recording large losses.

Because of the relatively small size of the sample, the analysis by Acharya *et al.* (2011) may not offer a complete view of the relation between dividends and bank risk taking. To fill this gap, I examine the interplay between dividends, risk, and charter values for a large number of banks. As a proxy for dividend payouts, I employ dividends as a percentage of total assets (*DPA*) for comparability with Table 3 in Acharya *et al.* (2011). I employ t-tests with unequal variances to test three null hypotheses.

[27] For a succinct appraisal of the main developments that resulted in a build-up of risk in the financial sector prior to the 2007–2009 crisis (and, in particular, the role of low interest rates), see Rajan (2006).

Test #6. Effect of losses in the previous quarter on *DPA*

H_N: [Average DPA_{it} if $NI_{it-1} \geq 0$] = [Average DPA_{it} if $NI_{it-1} < 0$]

where DPA_{it} denotes dividends to assets in the current quarter and NI_{it-1} denotes the net income in the previous quarter.

Test #7. Effect of charter value on *DPA* when a loss is recorded in the previous quarter

For $NI_{it-1} < 0$

H_N: [Average DPA_{it} if $Charter_{it} = 0$] = [Average DPA_{it} if $Charter_{it} = 1$]

Similar to Test #2, $Charter_{it} = 0$ ($Charter = 1$) indicates low (high) charter value.

Test #8. Effect of default risk on *DPA* when a loss is recorded in the previous quarter

For $NI_{it-1} < 0$

H_N: [Average DPA_{it} if $LnZ_{it} \geq LnZ_{.50}$] = [Average DPA_{it} if $LnZ_{it} < LnZ_{.50}$]

where $LnZ_{it} \geq LnZ_{.50}$ ($LnZ_{it} < LnZ_{.50}$) indicates low (high) default risk. To allow for the impact of size and related too-big-to-fail implicit guarantees, I repeat the tests above with respect to observations for which the total amount of assets exceeds the 90th percentile of the sample.

I test the hypotheses above using quarterly data for 455 US banks (BHCs, commercial banks, savings banks, and cooperative banks) for the period 2007–2009. Similar to the selection criteria for the sample examined in the rest of the paper, I consider only consolidated accounts. I use quarterly data (instead of annual) to have sufficient time series variability for such a short time span. I include only US banks in the sample because many EU banks do not publish their accounts quarterly.[28] While it would be interesting to compare the dividend policy of deposit institutions and investment banks (similar to Acharya *et al.*, 2011), the relevant data are available only for four investment banks. For this reason, I investigate only US banks. To make

[28] I downloaded quarterly data for EU banks (BHCs, commercial banks, savings banks, and cooperative banks) from Bankscope for the period 2007–2009. The data for *DP*A were available for 116 banks, but there were only 189 observations. On average, there were only 1.6 observations per bank (while for the US banks I have on average seven observations per bank), making any kind of time series analysis meaningless. The data for the components of *LnZ* were so scarce that I could calculate the average *LnZ* for only three quarters. For Tests #6, #7, and #8 the number of observations drops to 23 for 20 banks.

sure these are deposit institutions (and therefore subject to prompt corrective action), I check the figures relating to customer deposits for each bank.[29] In my sample, there are 683 observations (out of 3190) for which the net income is negative.

Figure 2 shows the average and 95% confidence intervals for the following variables: dividend payouts, *LnZ*, and the ratio of customer deposits to total assets (charter value). The *DPA* value decreases slowly over time. The value of *LnZ* decreases monotonically from Q3 2007 to Q4 2008 (just after Lehman Brothers collapsed). Then, it increases for two quarters, only to fall again in Q3 2009. Therefore, dividends and default risk are somewhat correlated until Q4 2008. The average charter value is relatively stable over the crisis period, although it increases slightly from Q2 2008 to Q3 2009.

Table 10 reports the results for the Tests #6, #7, and #8. The upper panel of Table 10 reports the results for the whole sample of 455 banks, while the lower part reports the results for large banks only (observations for which total assets exceed the 90th percentile of the sample distribution). The results for the whole sample show that when a loss is recorded in a certain quarter, *DPA* in the following quarter is, on average, smaller than if the net income is either equal or larger than zero. For cases for which a loss is recorded, charter value has an impact on dividends: On average, *DPA* is lower when charter value is high. This is consistent with the view that banks with high charter values are more risk averse. Consistent with the view that losses are correlated with high risk, the majority of observations for which there is a loss in a certain quarter (588/683 = 86%) correspond to cases for which default risk is high. When default risk is high, *DPA* is on average smaller than when default risk is low. These results contradict the risk-shifting hypothesis. The results for large banks mirror those for the whole sample with regard to the impact of losses on *DPA*. However, the results regarding the effect of charter value and default risk for the subset of observations relating to cases for which there is a loss in the previous quarter are insignificant.

[Insert table 10 here]

6. Conclusions and Policy Recommendations

Dividends can constitute a risk-shifting device for banks that are close to default, because they transfer risk to the debt holders and, via the deposit insurance, to the taxpayer. Capital requirements should help reduce moral hazard deriving from the deposit insurance and other

[29] For two of these banks, Bankscope reports zero customer deposits for one or more quarters. Both of these banks are recorded as commercial banks on Bankscope. Excluding these banks from the analysis has virtually no effect on my results.

types of government guarantees. Moreover, banks with high charter values have little or no incentive to gamble, even if default risk is high.

This paper investigates the interplay between dividends and bank risk, allowing for heterogeneity in capital ratios (equity to total assets and Basel regulatory ratios) and charter values (proxied by the ratio of customer deposits to total assets) for a sample of US and EU banks. Despite an overall positive relation between default risk and dividend payout ratios, I find little evidence of risk shifting. The relation between default risk and payout ratios is insignificant when default risk is very high (when the natural log of the Z-score is below the fifth or 10th percentile) and the incentive to gamble is strongest. Despite the potential adverse effects on the share price, listed banks tend to cut dividends if they are very close to default. Risk-shifting incentives tend to be offset by capital requirements and the desire to preserve the charter.

However, my results do not necessarily constitute evidence that denies the usefulness of regulatory restrictions on dividends for banks in distress (Basel III). Ultimately, one should expect a *negative* relation between default risk and payout ratios, especially for high levels of default risk. In other words, a bank's dividend policy should become more conservative when default risk is high. Conversely, some of my results suggest that many banks do very little to address issues regarding their soundness: The average payout ratio is higher for very high levels of default risk than for normal or low levels of default risk; dividend payments may keep increasing (although at a lower growth rate) despite very high default risk; during the 2007–2009 financial crisis, quarterly payout ratios (dividends to assets) did not decrease immediately, but only as the crisis unfolded, and many banks kept on paying dividends even after recording a loss. Therefore, they distributed equity reserves just when they would have been a valuable cushion against credit losses.

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Table 1. Explanatory variables in regressions on payout ratios (*DP*): Definitions and expected sign of the coefficients.

Proxy	Definition	Expected sign of the coefficient
LnZ	Natural logarithm of the Z-score: $LnZ_{it} = \ln(Z_{it}) = \ln[(ROA_{it} + E_{it} / TA_{it}) / SDROA_{it}]$ where Return on Assets (ROA) is the net income of bank *i* in period *t* plus the loan loss provision of bank *i* in period *t* divided by the total assets of bank *i* in period *t*. The variable E_{it} is the total equity (including common and preferred share capital and equity reserves) and TA_{it} is the total assets of bank *i* in period *t*. Finally, ROA volatility is calculated as $SDROA_{it} = \sqrt{\frac{1}{T-1}\sum_{t=-1}^{t+1}(ROA_{it} - \overline{ROA_i})^2}$ with $\overline{ROA_i} = \frac{1}{T}\sum_{t=-1}^{T-2} ROA_{it}$ and T = 3.	Negative (risk-shifting hypothesis)
Undercapitalised Bank	Dummy variable: 1 if the ratio of equity to total assets for bank *i* in period *t* is smaller than the sample median, and 0 otherwise	Negative (opportunity cost hypothesis)
Charter	Dummy variable: 1 if the ratio of customer deposits to total assets of bank *i* in period *t* are larger than the sample median, and 0 otherwise	Negative (charter value hypothesis)
Proxies for Insider–Outsider (IO) conflict		
Recorded Shareholders	Number of recorded shareholders in 2009[c]	Positive
Listed Bank	Dummy variable: 1 if bank *i* is listed on the stock market in period *t*, and 0 otherwise	Positive/Negative
IND1	Dummy variable: 1 if there is no shareholder with more than 25% of total ownership in 2009,[c] and 0 otherwise	Positive
IND2	Dummy variable: 1 if there is a shareholder with more than 25% of total ownership but no shareholder with more than 50% of total ownership in 2009,[c] and 0 otherwise	Excluded from regressions to avoid perfect collinearity
IND3	Dummy variable: 1 if there is a shareholder with more than 50% of total ownership in 2009,[c] and 0 otherwise	Negative
Profitability	Net income of bank *i* in year *t* plus the loan loss provision of bank *i* in year *t* divided by the total assets of bank *i* in year *t*. I prefer using ROA over return on equity because it does not take into account the effect of leverage on profitability and risk.	Positive
Loan Growth	Log of loans of bank *i* in period *t* minus log of loans of bank *i* in period *t* - 1	Negative
Size	Log of assets of bank *i* in period *t*	Positive
Earned Equity	Retained earnings of bank *i* in period *t* divided by the total equity of bank *i* in period *t*	Positive
IPO	Dummy variable: 1 if bank *i* went public in period *t*, and 0 otherwise	Positive
US	Dummy variable: 1 if bank *i* has its headquarters in the US and 0 otherwise	Positive

I report the expected sign of the coefficients on the basis of the findings of previous literature.

[a] The IO conflict should be stronger in cases where the shareholding base is more dispersed. The number of recorded shareholders and listing on a stock exchange should be positively related to shareholding dispersion, and should therefore lead to higher payout ratios. However, quotation on a stock exchange can act as a monitoring device for shareholders (Easterbrook, 1984). Thus, the expected coefficient of *Listed Bank* may be positive or negative (or insignificant). The dummy variables *IND1*, *IND2*, and *IND3* are independence indicators. Because *Listed Bank*, *Recorded Shareholders*, and the independence indicators are highly correlated, they are included one at a time in my multivariate analysis.

[b] To allow for earnings management, I calculate the ROA as the sum of net income and loan loss provisions, divided by total assets. However, the pairwise correlation between the unadjusted ROA and the adjusted ROA is 0.8178, (significant at the 1%), and therefore the results are likely to hold, irrespective of the proxy chosen. Section 4.5 provides robustness tests that employ the unadjusted ROA.

[c] Bankscope provides data for these variables only as of the last accounting year available. However, because these data tend to be sticky, it is unlikely that this has affected my results.

Table 2. Construction of the sample: 746 US and EU banks, sample period 2000–2007, annual data.

	Search criterion	Number of banks
Step 1	Geographic: US and EU (27) , for the period 1999-2008	25,104
Step 2	Specialisation: BHCs, commercial banks, cooperative banks, savings banks	22,585
Step 3	Consolidated accounts: C1 and C2 in Bankscope	3,974
Step 4	Information availability: listing on a stock exchange (listed, unlisted, or delisted)	3,968
Step 5	Information availability: dividends for year *t* and for year *t* - 1	1,193
Step 6	Information availability: other explanatory variables	746

Table 3. Descriptive statistics: 746 US and EU banks, sample period 2000–2008, annual data.

		US	EU	Listed	Unlisted	ALL
Sample composition	All Banks	440	306	398[a]	355	746
	BHCs	357	29	289[a]	100	386
	Commercial	80	200	89[a]	195	280
	Cooperative	1	44	16	29	45
	Savings	2	33	4	31	35
DP	Obs	2280	684	1737	1227	2964
	Mean	0.4114	0.3796	0.4050	0.4026	0.4040
	SD	0.8232	0.3965	0.5879	0.9264	0.7467
	p50	0.3333	0.3037	0.3532	0.2621	0.3265
	p1	0.0000	0.0000	0.0000	0.0000	0.0000
	p99	2.3587	1.8857	1.7428	2.5641	2.3235
LnZ	Obs	2280	684	1737	1227	2964
	Mean	4.2999***	3.7745	4.2767***	4.0398	4.1786
	SD	0.9572	1.0836	0.9659	1.0591	1.0121
	p50	4.3082	3.7834	4.2808	4.1138	4.2036
	p1	1.5188	1.3382	1.8810	1.3290	1.5188
	p99	6.5961	6.6412	6.5867	6.6265	6.5961
Capital Ratio	Obs	2280	684	1737	1227	2964
	Mean	0.0977***	0.0765	0.0910***	0.0955	0.0928
	SD	0.0388	0.0511	0.0366	0.0504	0.0429
	p50	0.0912	0.0682	0.0887	0.0864	0.0878
	p1	0.0543	0.0170	0.0270	0.0219	0.0258
	p99	0.2670	0.2368	0.1787	0.3147	0.2609
SDROA	Obs	2280	684	1737	1227	2964
	Mean	0.0027**	0.0041	0.0024***	0.0040	0.0030
	SD	0.0073	0.0161	0.0055	0.0141	0.0100
	p50	0.0014	0.0017	0.0014	0.0016	0.0014
	p1	0.0001	0.0001	0.0001	0.0001	0.0001
	p99	0.0222	0.0362	0.0174	0.0277	0.0234
Profitability	Obs	2280	684	1737	1227	2964
	Mean	0.0138***	0.0121	0.0130**	0.0140	0.0134
	SD	0.0116	0.0107	0.0080	0.0150	0.0114
	p50	0.0126	0.0105	0.0122	0.0121	0.0122
	p1	0.0001	-0.0028	0.0012	-0.0031	-0.0002
	p99	0.0512	0.0465	0.0360	0.0591	0.0509
Undercapitalised Bank	Obs	2280	684	1737	1227	2964
	Mean	0.4219***	0.7339	0.4744**	0.5216	0.4939
	SD	0.4940	0.4422	0.4995	0.4997	0.5000
	p50	0	1	0	1	0
	p1	0	0	0	0	0
	p99	1	1	1	1	1
Charter	Obs	2280	684	1737	1227	2964
	Mean	0.6189***	0.1769	0.5509***	0.4686	0.5169
	SD	0.4858	0.3819	0.4975	0.4992	0.4998
	p50	1	0	1	0	1
	p1	0	0	0	0	0
	p99	1	1	1	1	1

All the statistics are shown for banks for which *DP* and the other explanatory variables (including the first lag of the payout ratio, *DP*(-1)) are available. Negative payout ratios are treated as zero.

[a] Seven banks went public or were delisted during the sample period (three BHCs and four commercial banks). For this reason, they appear as both listed and unlisted, respectively, causing the sum of the banks in the columns Listed and Unlisted to be 753 instead of 746.

The superscripts ***, **, and * indicate the means of the two sub-samples (US and EU, or Listed and Unlisted) are significantly different at the 1%, 5%, and 10% levels, respectively, according to a two-sample t-test with unequal variances.

Table 3 continued

		US	EU	Listed	Unlisted	ALL
Loans Growth	Obs	2280	684	1737	1227	2964
	Mean	0.1161***	0.2010	0.1340	0.1381	0.1357
	SD	0.1937	0.2653	0.1649	0.2712	0.2153
	p50	0.0950	0.2215	0.1085	0.1172	0.1116
	p1	-0.3387	-0.5810	-0.2316	-0.5937	-0.3629
	p99	0.7063	0.9351	0.6654	1.0318	0.7665
Earned Equity	Obs	2280	684	1737	1227	2964
	Mean	0.5099***	0.3915	0.4902	0.4717	0.4826
	SD	0.3200	0.2964	0.3037	0.3384	0.3186
	p50	0.5177	0.3775	0.5007	0.4713	0.4841
	p1	-0.2966	-0.3065	-0.0985	-0.4706	-0.2966
	p99	1.1557	0.9508	1.1633	1.0377	1.1329
Size	Obs	2280	684	1737	1227	2964
	Mean	14.6048***	16.3726	14.9048***	15.1657	15.0128
	SD	1.5687	2.2565	1.8340	1.9873	1.9030
	p50	14.3891	16.2180	14.4746	14.9405	14.6245
	p1	12.1196	11.4534	12.5183	11.4675	11.8679
	p99	20.1284	21.2601	20.9482	20.4640	20.7426

All the statistics are shown for banks for which *DP* and the other explanatory variables (including the first lag of the payout ratio, *DP*(-1)) are available. Negative payout ratios are treated as zero.

[a] Seven banks went public or were delisted during the sample period (three BHCs and four commercial banks). For this reason, they appear as both listed and unlisted, respectively, causing the sum of the banks in the columns Listed and Unlisted to be 753 instead of 746.

The superscripts ***, **, and * indicate the means of the two sub-samples (US and EU, or Listed and Unlisted) are significantly different at the 1%, 5%, and 10% levels, respectively, according to a two-sample t-test with unequal variances.

Table 4. Pairwise correlations: 746 US and EU banks, sample period 2000–2008, annual data.

	DP	*DP(-1)*	*LnZ*	*Capital Ratio*	*SDROA*	*Charter*	*Undercapit. bank*	*Loan Growth*	*Earned Equity*	*Prof.ty*
DP(-1)	0.1734***									
LnZ	-0.0561***	-0.0482***								
Capital Ratio	0.0093	-0.0132	0.0307*							
SDROA	0.0379**	0.0227	-0.4473***	0.2010***						
Charter	-0.0465**	-0.0715***	0.1787***	-0.0272	-0.0867***					
Undercap Bank	-0.0044	0.0037	-0.0967***	-0.5551***	-0.0674***	-0.1049***				
Loans Growth	-0.1038***	-0.0943***	0.0342*	-0.0940***	-0.0948***	-0.0409**	0.0547***			
Earned Equity	0.0517***	0.0377**	0.1329***	-0.0084	-0.0341*	0.1047***	-0.0418**	-0.1330***		
Prof.ty	0.0331*	0.0188	-0.0841***	0.4237***	0.3333***	-0.0371**	-0.1852***	-0.1153***	0.1436***	
Size	0.0060	0.0352*	-0.1443***	-0.2530***	0.0204	-0.4360***	0.2250***	0.0920***	-0.0693***	-0.0301

All the statistics are shown for banks for which the payout ratio (dividends/net income), and the other explanatory variables (including the first lag of the payout ratio) are available. The correlations are calculated using 2964 observations. The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5. Regression results: 746 US and EU banks, sample period 2000–2008, annual data.

a) Specifications 1 and 2.

Dependent variable: ***DP***	**OLS1**	**FEM1**	**GMM1**	**OLS2**	**FEM2**	**GMM2**
DP(-1)	0.1731*** (0.0194)	-0.1437*** (0.0236)	0.0910 (0.0602)	0.1733*** (0.0194)	-0.1456*** (0.0236)	0.0979* (0.0552)
LnZ	-0.0395*** (0.0140)	-0.0539*** (0.0204)	-0.0752** (0.0350)	-0.0527*** (0.0189)	-0.0484* (0.0262)	-0.1400** (0.0619)
Undercapitalised Bank				-0.1185 (0.1166)	0.1430 (0.1626)	-0.5954** (0.2538)
Undercap. × *LnZ*				0.0281 (0.0270)	-0.0036 (0.0369)	0.1357** (0.0595)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2964	2964	2964	2964	2964	2964
Banks	746	746	746	746	746	746
F	9.233***	4.703***		8.208***	4.572***	
Wald χ^2			44.15***			59.88***
m1			-2.410			-2.486
m2			-1.158			-0.991
p-Value (m1)			0.016			0.013
p-Value (m2)			0.247			0.322
Difference-in-Hansen tests of exogeneity of instrument subsets for the GMM specifications:						
GMM instruments DP(-1):						
Differenced equations	N. instruments p-values		5 0.732			5 0.751
Level equations	N. instruments p-values		4 0.349			4 0.238
GMM instruments for LnZ:						
Differenced equations	N. instruments p-values		5 0.232			5 0.260
Level equations	N. instruments p-values		4 0.659			4 0.687
Standard instruments (levels only)	N. instruments p-values		13 0.210			15 0.188

Standard errors are reported in parentheses. Controls include the variables *Loan Growth*, *Size*, *Earned Equity*, *IPO*, *Listed Bank*, *US*, and year effects, and *DP*(-1) denotes the first lag of *DP*. Here OLS1 and OLS2 are OLS regressions; FEM1 and FEM2 are fixed-effects panel data regressions; GMM1 and GMM2, are systems of first-differenced and level equations. The notations m1 and m2 refer to tests for the absence of first- and second-order autocorrelation in the first-differenced residuals, respectively. Under the null hypothesis, m1 and m2 are asymptotically distributed as standard normal variables with mean zero and variance one. The statistic m1 being significantly different from zero is consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are valid). The statistic m2 being significantly different from zero is not consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are invalid). Hansen refers to the test statistic for over-identifying restrictions, distributed asymptotically as χ^2(df) when the null hypothesis of exogeneity of the instruments is satisfied. All GMM-SYS regressions are estimated using a two-step approach and standard errors are adjusted using Windmeijer (2005) small-sample variance correction (Roodman, 2006). The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 5 continued

b) Specifications 3 and 4.

Dependent variable: ***DP***	**OLS3**	**FEM3**	**GMM3**	**OLS4**	**FEM4**	**GMM4**
DP(-1)	0.1708*** (0.0194)	-0.1439*** (0.0236)	0.1007* (0.0585)	0.1710*** (0.0194)	-0.1458*** (0.0236)	0.1117** (0.0540)
LnZ	-0.0301 (0.0189)	-0.0441 (0.0281)	-0.1312* (0.0756)	-0.0414* (0.0238)	-0.0365 (0.0336)	-0.1794 (0.1116)
Undercapitalised Bank				-0.0881 (0.1177)	0.1491 (0.1635)	-0.5459* (0.3285)
Undercap. × *LnZ*				0.0214 (0.0272)	-0.0051 (0.0371)	0.1261 (0.0780)
Charter	-0.0104 (0.1186)	0.1389 (0.1656)	-0.5959* (0.3077)	-0.0197 (0.1193)	0.1469 (0.1660)	-0.5623* (0.3261)
Charter × *LnZ*	-0.0151 (0.0272)	-0.0192 (0.0370)	0.1285* (0.0738)	-0.0124 (0.0275)	-0.0218 (0.0371)	0.1232 (0.0797)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2964	2964	2964	2964	2964	2964
Banks	746	746	746	746	746	746
F	8.506***	4.193***		7.640***	4.133***	
Wald χ^2			52.49***			60.12***
m1			-2.468			-2.537
m2			-0.862			-0.755
p-Value (m1)			0.014			0.011
p-Value (m2)			0.389			0.450
Difference-in-Hansen tests of exogeneity of instrument subsets for the GMM specifications:						
GMM instruments DP(-1):						
Differenced equations	N. instruments p-values		5 0.661			5 0.604
Level equations	N. instruments p-values		4 0.268			4 0.118
GMM instruments for LnZ:						
Differenced equations	N. instruments p-values		5 0.236			5 0.376
Level equations	N. instruments p-values		4 0.594			4 0.415
Standard instruments (levels only)	N. instruments p-values		16 0.280			16 0.163

Standard errors are reported in parentheses. Controls include the variables *Loan Growth*, *Size*, *Earned Equity*, *IPO*, *Listed Bank*, *US*, and year effects, and *DP*(-1) denotes the first lag of *DP*. Here OLS3 and OLS4 are OLS regressions; FEM3 and FEM4 are fixed-effects panel data regressions; GMM3 and GMM4 are systems of first-differenced and level equations. The notations m1 and m2 refer to tests for the absence of first- and second-order autocorrelation in the first-differenced residuals, respectively. Under the null hypothesis, m1 and m2 are asymptotically distributed as standard normal variables with mean zero and variance one. The statistic m1 being significantly different from zero is consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are valid). The statistic m2 being significantly different from zero is not consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are invalid). Hansen refers to the test statistic for over-identifying restrictions, distributed asymptotically as χ^2(df) when the null hypothesis of exogeneity of the instruments is satisfied. All GMM-SYS regressions are estimated using a two-step approach and standard errors are adjusted using Windmeijer (2005) small-sample variance correction (Roodman, 2006). The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 6. Regression results with winsorisation of all variables at the first and 99th percentiles: 746 US and EU banks, sample period 2000–2008, annual data.

a) Specifications 1 and 2.

Dependent variable: ***DP***	**OLS1**	**FEM1**	**GMM1**	**OLS2**	**FEM2**	**GMM2**
DP(-1)	0.3184***	-0.0443***	0.0918*	0.3187***	-0.0455***	0.0956**
	(0.0144)	(0.0166)	(0.0491)	(0.0143)	(0.0166)	(0.0459)
LnZ	-0.0069	-0.0332***	-0.0541**	-0.0178**	-0.0335***	-0.1055**
	(0.0065)	(0.0079)	(0.0248)	(0.0086)	(0.0101)	(0.0455)
Undercapitalised Bank				-0.1098**	0.0294	-0.4640**
				(0.0513)	(0.0602)	(0.1865)
Undercap. × *LnZ*				0.0222*	0.0038	0.1044**
				(0.0118)	(0.0136)	(0.0436)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2964	2964	2964	2964	2964	2964
Banks	746	746	746	746	746	746
F	40.69***	6.489***		36.25***	6.095***	
Wald χ^2			83.50***			93.38***
m1			-5.360			-5.417
m2			-0.747			-0.838
p-Value (m1)			0.000			0.000
p-Value (m2)			0.455			0.402
Difference-in-Hansen tests of exogeneity of instrument subsets for the GMM specifications:						
GMM instruments DP(-1):						
Differenced equations	N. instruments		5		5	
	p-values		0.201		0.222	
Level equations	N. instruments		4		4	
	p-values		0.215		0.162	
GMM instruments for LnZ:						
Differenced equations	N. instruments		5		5	
	p-values		0.302		0.344	
Level equations	N. instruments		4		4	
	p-values		0.553		0.457	
Standard instruments	N. instruments		14		16	
(levels only)	p-values		0.373		0.385	

Dependent and independent continuous variables are winsorised at the first and 99th percentiles. Standard errors are reported in parentheses. Controls include the variables *Loan Growth*, *Size*, *Earned Equity*, *IPO*, *Listed Bank*, *US*, and year effects, and *DP*(-1) denotes the first lag of *DP*. Here OLS1 and OLS2 are OLS regressions; FEM1 and FEM2 are fixed-effects panel data regressions; GMM1 and GMM2 are systems of first-differenced and level equations. The notations m1 and m2 refer to tests for the absence of first- and second-order autocorrelation in the first-differenced residuals, respectively. Under the null hypothesis, m1 and m2 are asymptotically distributed as standard normal variables with mean zero and variance one. The statistic m1 being significantly different from zero is consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are valid). The statistic m2 being significantly different from zero is not consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are invalid). Hansen refers to the test statistic for over-identifying restrictions, distributed asymptotically as χ^2(df) when the null hypothesis of exogeneity of the instruments is satisfied. All GMM-SYS regressions are estimated using a two-step approach and standard errors are adjusted using Windmeijer (2005) small-sample variance correction (Roodman, 2006). The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 6 continued

b) Specifications 3 and 4.

Dependent variable: ***DP***	**OLS3**	**FEM3**	**GMM3**	**OLS4**	**FEM4**	**GMM4**
DP(-1)	0.3163*** (0.0144)	-0.0444*** (0.0166)	0.1071** (0.0469)	0.3166*** (0.0144)	-0.0456*** (0.0166)	0.1149** (0.0455)
LnZ	0.0020 (0.0088)	-0.0269** (0.0110)	-0.0777* (0.0463)	-0.0076 (0.0110)	-0.0263** (0.0131)	-0.1153 (0.0723)
Undercapitalised Bank				-0.0904* (0.0517)	0.0346 (0.0605)	-0.3775* (0.2051)
Undercap. × *LnZ*				0.0178 (0.0120)	0.0026 (0.0137)	0.0853* (0.0486)
Charter	0.0205 (0.0535)	0.0557 (0.0623)	-0.3449* (0.1900)	0.0163 (0.0538)	0.0574 (0.0625)	-0.3375 (0.2113)
Charter × *LnZ*	-0.0151 (0.0123)	-0.0115 (0.0139)	0.0713 (0.0455)	-0.0135 (0.0124)	-0.0121 (0.0140)	0.0715 (0.0517)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2964	2964	2964	2964	2964	2964
Banks	746	746	746	746	746	746
F	36.65***	5.724***		33.01***	5.462***	
Wald χ^2			88.18***			92.83***
m1			-5.375			-5.377
m2			-0.604			-0.621
p-Value (m1)			0.000			0.000
p-Value (m2)			0.546			0.535
Difference-in-Hansen tests of exogeneity of instrument subsets for the GMM specifications:						
GMM instruments DP(-1):						
Differenced equations	N. instruments p-values		5 0.217			5 0.199
Level equations	N. instruments p-values		4 0.128			4 0.073
GMM instruments for LnZ:						
Differenced equations	N. instruments p-values		5 0.425			5 0.570
Level equations	N. instruments p-values		4 0.410			4 0.244
Standard instruments (levels only)	N. instruments p-values		15 0.176			16 0.165

Dependent and independent continuous variables are winsorised at the first and 99th percentiles. Standard errors are reported in parentheses. Controls include the variables *Loan Growth*, *Size*, *Earned Equity*, *IPO*, *Listed Bank*, *US*, and year effects, and *DP*(-1) denotes the first lag of *DP*. Here OLS3 and OLS4 are OLS regressions; FEM3 and FEM4 are fixed-effects panel data regressions; GMM3 and GMM4 are systems of first-differenced and level equations. The notations m1 and m2 refer to tests for the absence of first- and second-order autocorrelation in the first-differenced residuals, respectively. Under the null hypothesis, m1 and m2 are asymptotically distributed as standard normal variables with mean zero and variance one. The statistic m1 being significantly different from zero is consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are valid). The statistic m2 being significantly different from zero is not consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are invalid). Hansen refers to the test statistic for over-identifying restrictions, distributed asymptotically as χ^2(df) when the null hypothesis of exogeneity of the instruments is satisfied. All GMM-SYS regressions are estimated using a two-step approach and standard errors are adjusted using Windmeijer (2005) small-sample variance correction (Roodman, 2006). The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 7. Piecewise regression results: 746 US and EU banks, sample period 2000–2008, annual data.

a) Knots at $LnZ = LnZ_{.05}$ and $LnZ = LnZ_{.50}$

Dependent variable *DP*	**GMM1**	**GMM2**	**GMM3**	**GMM4**
DP(-1)	0.1384*** (0.0468)	0.1246** (0.0512)	0.1300*** (0.0462)	0.1293*** (0.0425)
LnZ_1	0.3090 (0.5930)	0.1134 (0.7601)	0.0253 (1.1386)	0.1591 (1.1249)
LnZ_2	-0.1434*** (0.0529)	-0.3479** (0.1408)	-0.2592** (0.1053)	-0.4360*** (0.1502)
LnZ_3	0.0249 (0.0251)	0.0730 (0.0446)	0.0583* (0.0320)	0.0971** (0.0485)
Undercapitalised Bank		-0.3502 (1.7254)		-0.2386 (1.0031)
Undercap. × LnZ_1		-0.0515 (0.7674)		-0.0656 (0.4296)
Undercap. × LnZ_2		0.3354** (0.1428)		0.2722*** (0.1015)
Undercap. × LnZ_3		-0.0808 (0.0491)		-0.0550 (0.0506)
[1- Charter]			-0.3335 (2.7011)	-0.1840 (2.0963)
[1- Charter] × LnZ_1			0.0275 (1.1331)	-0.0420 (0.8721)
[1- Charter] × LnZ_2			0.2457** (0.1049)	0.2539*** (0.0965)
[1- Charter] × LnZ_3			-0.0879** (0.0420)	-0.0868** (0.0401)
Controls	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Observations	2964	2964	2964	2964
Banks	746	746	746	746
Wald χ^2	70.07***	76.17***	66.46***	85.20***
m1	-2.580**	-2.600***	-2.589**	-2.629***
m2	-0.418	-1.031	-0.883	-1.030
Hansen	36.32	36.98	33.95	35.70
Number of instruments	50	54	54	58

Standard errors are reported in parentheses. Controls include the variables *Loan Growth*, *Size*, *Earned Equity*, *IPO*, *Listed Bank*, *US*, and year effects, and *DP*(-1) denotes the first lag of *DP*. Here GMM1, GMM2, GMM3 and GMM4 are systems of first-differenced and level equations. The notations m1 and m2 refer to tests for the absence of first- and second-order autocorrelation in the first-differenced residuals, respectively. Under the null hypothesis, m1 and m2 are asymptotically distributed as standard normal variables with mean zero and variance one. The statistic m1 being significantly different from zero is consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are valid). The statistic m2 being significantly different from zero is not consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are invalid). Hansen refers to the test statistic for over-identifying restrictions, distributed asymptotically as χ^2(df) when the null hypothesis of exogeneity of the instruments is satisfied. All GMM-SYS regressions are estimated using a two-step approach and standard errors are adjusted using Windmeijer (2005) small-sample variance correction (Roodman, 2006). The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 7 continued

b) Knots at: $LnZ = LnZ_{.10}$ and $LnZ = LnZ_{.50}$

Dependent variable *DP*	**GMM1**	**GMM2**	**GMM3**	**GMM4**
DP(-1)	0.1209** (0.0513)	0.1181** (0.0483)	0.1204** (0.0506)	0.1227*** (0.0448)
LnZ_1	-0.2720 (0.4566)	-0.3130 (0.4401)	-0.1799 (0.6730)	-0.3624 (0.6630)
LnZ_2	-0.0942 (0.0608)	-0.2608* (0.1496)	-0.2072* (0.1229)	-0.3345** (0.1582)
LnZ_3	0.0139 (0.0264)	0.0562 (0.0473)	0.0520 (0.0320)	0.0775 (0.0489)
Undercapitalised Bank		-1.2884 (1.1783)		-0.7426 (0.8801)
Undercap. × LnZ_1		0.3684 (0.4477)		0.1742 (0.3209)
Undercap. × LnZ_2		0.2364 (0.1550)		0.2313** (0.1117)
Undercap. × LnZ_3		-0.0612 (0.0517)		-0.0461 (0.0516)
[1- Charter]			-0.7673 (1.8545)	-0.9823 (1.4122)
[1- Charter] × LnZ_1			0.2367 (0.6725)	0.3127 (0.5047)
[1- Charter] × LnZ_2			0.1742 (0.1264)	0.1623 (0.1067)
[1- Charter] × LnZ_3			-0.0717* (0.0426)	-0.0687* (0.0409)
Controls	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Observations	2964	2964	2964	2964
Banks	746	746	746	746
Wald χ^2	61.93***	69.79***	60.20***	82.80***
m1	-2.502**	-2.624***	-2.573**	-2.645***
m2	-1.364	-0.874	-1.172	-1.158
Hansen	34.78	36.65	34.95	36.77
Number of Instruments	50	54	54	58

Standard errors are reported in parentheses. Controls include the variables *Loan Growth*, *Size*, *Earned Equity*, *IPO*, *Listed Bank*, *US*, and year effects, and *DP*(-1) denotes the first lag of *DP*. Here GMM1, GMM2, GMM3 and GMM4 are systems of first-differenced and level equations. The notations m1 and m2 refer to tests for the absence of first- and second-order autocorrelation in the first-differenced residuals, respectively. Under the null hypothesis, m1 and m2 are asymptotically distributed as standard normal variables with mean zero and variance one. The statistic m1 being significantly different from zero is consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are valid). The statistic m2 being significantly different from zero is not consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are invalid). Hansen refers to the test statistic for over-identifying restrictions, distributed asymptotically as χ^2(df) when the null hypothesis of exogeneity of the instruments is satisfied. All GMM-SYS regressions are estimated using a two-step approach and standard errors are adjusted using Windmeijer (2005) small-sample variance correction (Roodman, 2006). The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 8. Regression results for the effect of being close to the regulatory minimum: 746 US and EU banks, sample period 2000–2008, annual data.

Dependent variable: *DP*	**OLS2**	**FEM2**	**GMM2**	**OLS4**	**FEM4**	**GMM4**
DP(-1)	0.1727*** (0.0194)	-0.1436*** (0.0236)	0.0923 (0.0594)	0.1703*** (0.0194)	-0.1438*** (0.0237)	0.1011* (0.0575)
LnZ	-0.0425*** (0.0143)	-0.0547*** (0.0206)	-0.0772** (0.0357)	-0.0351* (0.0194)	-0.0451 (0.0284)	-0.1423* (0.0802)
Close	-0.4471 (0.2817)	-0.1524 (0.4318)	-0.5099*** (0.1742)	-0.4228 (0.2845)	-0.1214 (0.4338)	-0.6999** (0.3025)
Close × *LnZ*	0.0795 (0.0694)	0.0263 (0.1071)	0.1013** (0.0434)	0.0734 (0.0702)	0.0195 (0.1075)	0.1496** (0.0763)
Charter				-0.0294 (0.1197)	0.1348 (0.1664)	-0.6345** (0.3236)
Charter × *LnZ*				-0.0104 (0.0275)	-0.0185 (0.0371)	0.1379* (0.0777)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2964	2964	2964	2964	2964	2964
Banks	746	746	746	746	746	746
F	8.418***	4.126***		7.840***	3.734***	
Wald χ^2			53.85***			60.05***
m1			-2.429			-2.489
m2			-1.122			-0.820
p-Value (m1)			0.015			0.013
p-Value (m2)			0.262			0.412
Difference-in-Hansen tests of exogeneity of instrument subsets for the GMM specifications:						
GMM instruments DP(-1):						
Differenced equations	N. instruments p-values		5 0.712			5 0.670
Level equations	N. instruments p-values		4 0.340			4 0.284
GMM instruments for LnZ:						
Differenced equations	N. instruments p-values		5 0.266			5 0.268
Level equations	N. instruments p-values		4 0.670			4 0.676
Standard instruments (levels only)	N. instruments p-values		16 0.297			16 0.301

Standard errors are reported in parentheses. Close is equal to one if either the tier 1 ratio of the previous year is below 6% or the total capital ratio of the previous year is below 10%, and zero otherwise. Controls include the variables *Loan Growth*, *Size*, *Earned Equity*, *IPO*, *Listed Bank*, *US*, and year effects, and *DP*(-1) denotes the first lag of *DP*. Here, OLS2 and OLS4 are OLS regressions; FEM2 and FEM4 are fixed-effects panel data regressions; GMM2 and GMM4, are systems of first-differenced and level equations. The notations m1 and m2 refer to tests for the absence of first- and second-order autocorrelation in the first-differenced residuals, respectively. Under the null hypothesis, m1 and m2 are asymptotically distributed as standard normal variables with mean zero and variance one. The statistic m1 being significantly different from zero is consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are valid). The statistic m2 being significantly different from zero is not consistent with the assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are invalid). Hansen refers to the test statistic for over-identifying restrictions, distributed asymptotically as χ^2(df) when the null hypothesis of exogeneity of the instruments is satisfied. All GMM-SYS regressions are estimated using a two-step approach and standard errors are adjusted using Windmeijer (2005) small-sample variance correction (Roodman, 2006). The superscripts ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 9. Very high default risk and dividend changes: 746 US and EU banks, sample period 2000–2008, annual data.

		Whole sample		
		Effect of very high default risk		
	No high risk (1)	Very high risk (2)	Mean(1) - Mean(2)	t-test
Average ΔDiv_{it}	58.12%	7.01%	51.11%	3.3766***
No. Observations	2413	105		
		Effect of charter value when default risk is very high		
	Low Charter (1)	High Charter (2)	Mean(1) - Mean(2)	t-test
Average ΔDiv_{it}	12.96%	-7.17%	20.13%	1.2827
No. Observations	74	31		
		Sub-sample of 67 listed banks		
		Effect of very high default risk		
	No very high risk (1)	Very high risk (2)	Mean(1) - Mean(2)	t-test
Average ΔVol_{it}	0.05%	1.24%	-1.19%	-5.6104***
No. Observations	400	100		
Average ΔDiv_{it}	19.27%	-6.46%	25.73%	3.1343***
No. Observations	225	74		
Average ΔDiv_{it} if $\Delta Vol_{it} > 0$	22.19%	-17.43%	39.61%	4.0912***
No. Observations	117	51		
		Effect of charter value when default risk is very high		
	Low charter (1)	High charter (2)	Mean(1) - Mean(2)	t-test
Average ΔDiv_{it}	-0.88%	-17.41%	16.54%	1.2364
No. Observations	49	25		
Average ΔDiv_{it} if $\Delta Vol_{it} > 0$	-11.43%	-27.52%	-16.09%	1.1306
No. Observations	32	19		

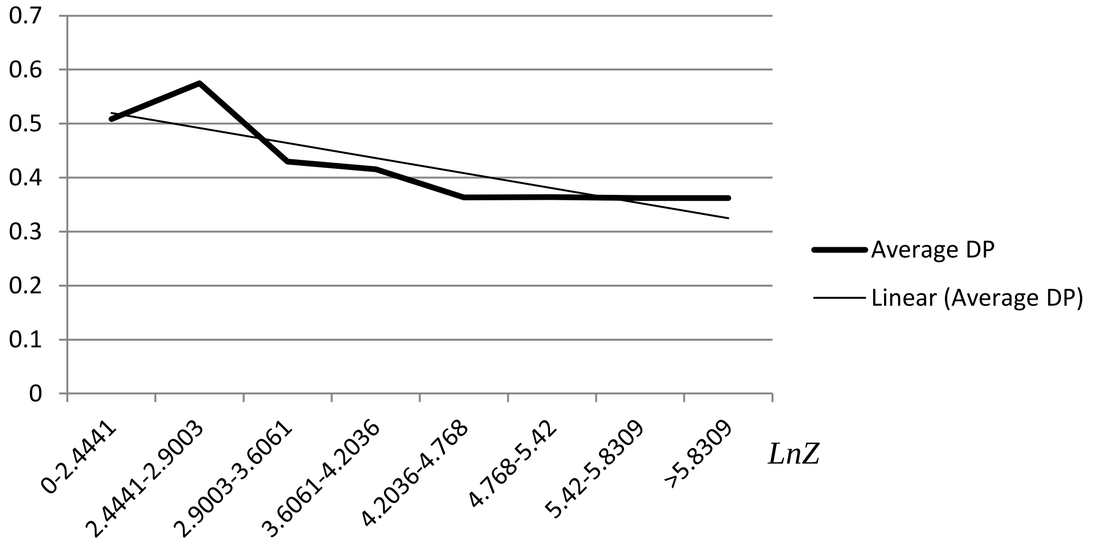
Low (High) charter corresponds to cases for which the ratio of customer deposits to total assets is lower than or equal to (larger than) the median.

Table 10. Dividends, losses, and charter value during the 2007–2009 financial crisis: 455 US banks, quarterly data.

		Whole sample		
		Effect of losses in the previous quarter		
	No loss (1)	Loss (2)	Mean(1) - Mean(2)	t-test
Average DPA_{it}	0.1003%	0.0213%	0.0791%	17.4094***
No. Obs.	2507	683		
		Effect of charter value when there is a loss in the previous quarter		
	Low Charter (1)	High Charter (2)	Mean(1) - Mean(2)	t-test
Average DPA_{it}	0.0254%	0.0168%	0.0086%	2.3498**
No. Obs.	359	324		
		Effect of default risk when there is a loss in the previous quarter		
	Low Risk (1)	High Risk (2)	Mean(1) - Mean(2)	t-test
Average DPA_{it}	0.0348%	0.0191%	0.0157%	2.028**
No. Obs.	95	588		
		Large banks only (total assets higher than 90th percentile)		
		Effect of losses in the previous quarter		
	No loss (1)	Loss (2)	Mean(1) - Mean(2)	t-test
Average DPA_{it}	0.1027%	0.0211%	0.0817%	9.3692***
No. Obs.	228	103		
		Effect of charter value when there is a loss in the previous quarter		
	Low Charter (1)	High Charter (2)	Mean(1) - Mean(2)	t-test
Average DPA_{it}	0.0223%	0.0085%	0.0137%	1.4427
No. Obs.	94	9		
		Effect of default risk when there is a loss in the previous quarter		
	Low Risk (1)	High Risk (2)	Mean(1) - Mean(2)	t-test
Average DPA_{it}	0.0115%	0.0234%	-0.0118%	-1.2117
No. Obs.	20	83		

No loss (Loss) denotes cases for which the net income in the previous quarter is larger than or equal to (smaller than) zero. Low (High) charter corresponds to cases for which the ratio of customer deposits to total assets is lower than or equal to (larger than) the median. Low (High) risk corresponds to cases for which *LnZ* is larger than or equal to (lower than) the median.

Figure 1. Average payout ratios for different levels of default risk: 746 US and EU banks, sample period 2000–2008, annual data.

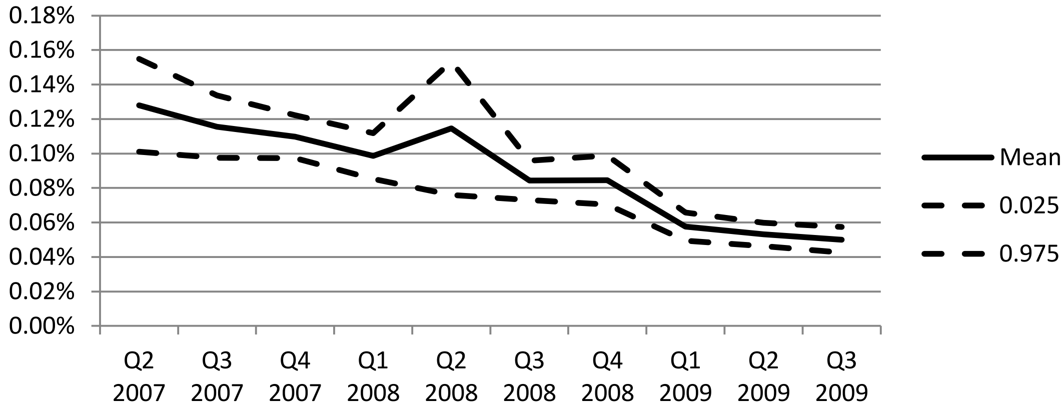


Notes: The following table shows the average payout ratios for eight portions of the distribution of *LnZ*:

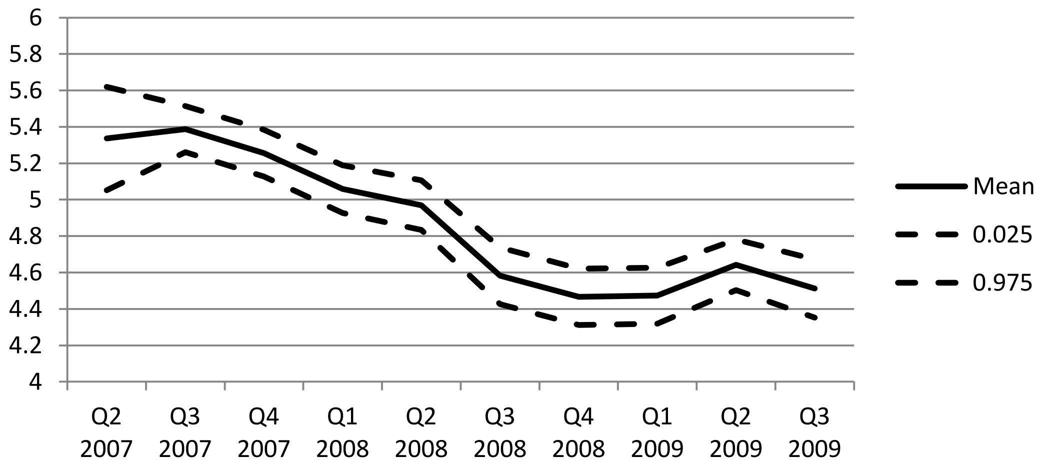
1. $LnZ < LnZ_{.05}$ (2.4441)
2. $LnZ_{.05} \leq LnZ < LnZ_{.10}$ (2.9003)
3. $LnZ_{.10} \leq LnZ < LnZ_{.25}$ (3.6061)
4. $LnZ_{.25} \leq LnZ < LnZ_{.50}$ (4.2036)
5. $LnZ_{.50} \leq LnZ < LnZ_{.75}$ (4.768)
6. $LnZ_{.75} \leq LnZ < LnZ_{.90}$ (5.42)
7. $LnZ_{.90} \leq LnZ < LnZ_{.95}$ (5.8309)
8. $LnZ > LnZ_{.95}$

Figure 2. Payout ratios, risk, and charter value during the 2007–2009 financial crisis: 455 US banks, quarterly data.

a) Payout ratios (dividends to total assets)



b) Risk (*LnZ*)



c) Charter value (ratio of customer deposits to total assets)