Moral hazard, dividends and risk in banks[†]

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Abstract

This paper is the first investigation of the interplay between dividends and risk taking in banks. I examine the role of dividends as a risk-shifting mechanism that can exacerbate moral hazard, controlling for standard determinants of dividends in nonfinancial firms. My main findings show that banks that are close to depleting their capital pay more dividends to their shareholders, suggesting that dividends are used to shift risk from bank owners to the taxpayer. These findings support recent policy proposals that include restrictions on dividends as part of a set of early regulatory responses to bank distress (Geneva Report, Brunnermeier, 2009).

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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. Press Release, 15 September 2009, p1.

1. Introduction

Banks hit by the financial crisis of 2007-2009 can replenish their capital either by retaining earnings or by issuing new capital. Recently, Acharya *et al.* (2009) have pointed out that banks continued to pay large dividends[1] to their shareholders during the crisis despite expecting large credit losses, breaching the principle of priority of debt over equity. This type of behaviour can lead to default, and should therefore be avoided by banks.

Under certain circumstances, however, banks are encouraged to increase bankruptcy risk. This type of moral hazard behaviour can be caused by regulation that insulates bank owners from bankruptcy risk (implicit bailout guarantees). Fixed-rate deposit insurance schemes can also generate moral hazard on the part of bank owners. Because the value of the government guarantee is positively related to risk, maximization of the value of the deposit insurance may lead to socially undesirable levels of risk-taking (Merton, 1977). Capital adequacy regulation (1988 Basel Accord and subsequent refinements) should reduce moral hazard deriving from deposit insurance regulation, but can be circumvented by practices of capital management and by using hybrid instruments. Moreover, capital requirements increase the cost of bank equity and decrease franchise value, incentivising risk-taking.

Dividends may exacerbate moral hazard because of three reasons. First, they reduce the market value of assets, increasing the likelihood that it will drop below the face value of outstanding debt. Therefore, dividends increase the value of deposit insurance. Second, they transfer wealth from the bank to its owners, reducing the negative impact of a default on the personal wealth of bank owners. Third, banks tend to deplete their safer assets to pay dividends, leaving on their balance sheet the riskier assets. Therefore, dividends are a risk-shifting mechanism that impinges on the capital structure of the firm, leading to a thinner equity buffer and riskier assets on the balance sheet (Acharya *et al.*, 2009).

Risk-shifting should be reduced by capital adequacy regulation, because capital requirements force banks to internalise a large portion of the potential negative externalities of a

[1] To expedite discussion, I use the term 'dividends' to refer to cash dividends throughout the paper.

default. Banks whose asset quality is poor should, other things being equal, have higher capital ratios than banks with better asset quality. In such circumstances, capital requirements would imply a trade-off between investment growth (in particular loans growth) and dividends: given a targeted investment growth rate, the lower the capital ratio, the higher is the opportunity cost of distributing dividends, because dividends reduce the ability of a bank to increase its capital ratio to a level compatible with the objectives of its investment policy. In other words, dividends are an opportunity cost as they may lead to rejection of profitable projects. Therefore, while banks with higher default risk may attempt to shift this risk to debt holders and taxpayers by paying dividends, capital requirements should impose costs on banks that pay dividends in the form of a reduction in growth potential. To the extent that capital requirements are effective in capturing the overall riskiness of the investment portfolio of a bank, the benefits of risk-shifting through dividends should be offset by the opportunity costs generated by capital requirements.

Despite the importance of dividends, the literature on the dividend policy of banks is rather sparse, and it is concerned with U.S. banks only. Concentrating on both American and European banks is worthwhile because, unlike in the U.S., in Europe there are no Prompt Corrective Action (PCA) procedures that can constrain banks' discretion in their financing decisions prior to and during a bank distress. PCA procedures help reduce the risk of a bank failure or of a bailout from the government (ESFRC, 2006). Recently, 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 likely to be included in the 'Basel III' framework, as highlighted by a recent speech by the General Manager of the Bank for International Settlements, Mr Jaime Caruana, who suggests that constraints be imposed on earnings distributions (including dividends, share buybacks and bonuses) '[…] the closer a bank's capital level gets to the minimum requirement' (Caruana, 2010, p. 3).

In this paper, I fill the current gap in the literature by investigating the relationship between several risk measures and dividends in a sample of 440 U.S. and 306 European banks (from the 27 EU countries) for the period 2000-2008.

I investigate the impact of default risk on dividends, by using the natural logarithm of the Z-score (Boyd and Graham, 1988), which is negatively related to the risk that a bank will deplete completely its equity capital. I use the natural logarithm of of the Z-score because the Z-score is highly skewed, while the log of the Z-score is normal (Laeven and Levine, 2009). According to a 'risk-shifting' hypothesis, banks with a low Z-score (i.e., high default risk) are incentivised to increase dividends, because dividends help transfer this risk to the taxpayer. However, Keeley (1990) argues that deposit insurance regulation may reduce risk-taking if it results in higher charter value for insured banks. Deposit insurance, similar to any type of government guarantee, would ensure lower refinancing costs to protected banks, leading to higher charter values (Gropp *et al.*, 2010). Because charter value is lost in the case of a default, implicit or explicit government guarantees may lead to lower risk taking.

To summarise, while a 'risk-shifting' hypothesis is consistent with a negative relationship between default risk and dividends (or a positive relationship between default risk and dividends), the opportunity costs deriving from losing the charter value in the case of a default imply a negative relationship between default risk and dividends.

To investigate further the relationship between risk and dividends, I consider the impact of the variables that are used to calculate the Z-score separately: the capital ratio, calculated as equity to total assets, returns volatility, and profitability. The latter variable should of course have a positive effect on dividends. However, the relationship between dividends and the other two variables deserves investigation. A corollary of my risk-shifting hypothesis is that capital ratio should be negatively related to dividends, while returns volatility should be positively related to dividends.

My findings show that dividend payout ratios are positively related to default risk (negatively related to the Z-score). Capital ratio has a negative effect on dividends, and some evidence is found of a positive relationship between dividends and ROA volatility. These results are consistent with the risk-shifting hypothesis.

My findings have important policy implications, especially in light of the current debate on the need for banks to avoid paying large dividends. They suggest that restrictions on dividends may be needed to prevent bank owners from transferring the negative consequences of default risk to the taxpayer, and therefore support the recent proposals for the Basel III framework.

A further contribution of the paper is methodological. To my knowledge, this is the first paper that allows for endogeneity of risk proxies in regressions where dividend payout ratios are the dependent variable. To do so, I employ dynamic panel data models that allow for an autoregressive component in dividend payout ratios.

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. Section 5 investigates the role of retained earnings and expectation of government support during financial distress in the dividend policy of a bank. Section 6 summarises and concludes.

2. Related literature and hypotheses

This paper relates to two strands of literature. The first strand investigates the determinants of the dividend policy of nonfinancial firms. The second strand relates to the relationship between regulation and the attitude towards risk in banking, and the possibility that certain types of regulation produce moral hazard.[2]

The literature on the dividend policy of nonfinancial firms argues that, other things being equal, risk should reduce dividend payments (Rozeff, 1982; Bar-Yosef and Huffman, 1986). This begs the question of whether risk and dividends are negatively related in banking and calls for an investigation of the influence of regulation on the relationship between dividends and risk.

Deposit insurance regulation may increase the likelihood of moral hazard in the form of excessive risk taking because it discourages monitoring from depositors.[3] Moreover, deposit insurance can be thought of as a put option on the bank's asset (Merton, 1977) whose value is positively related to business risk and leverage. Under a fixed-rate system, banks may exploit the deposit insurance scheme by increasing leverage and risk (Keeley, 1990).[4] In the event of default, banks can exploit the deposit insurance scheme 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, as 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)[5]. Moreover, banks tend to sell their safer assets to distribute dividends. Therefore, dividends can be a risk-shifting device for bank

[2] Recent literature has investigated whether regulation in the financial sector (in particular deposit insurance and capital adequacy regulation) impinges 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 relationship between dividends and risk in the presence of bank regulation.
[3] 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).
[4] Schemes with a more sophisticated fee structure can help reduce moral hazard (Chan *et al.*, 1992; and Gianmarino *et al.*, 1993).
[5] For a more detailed discussion of the role of dividends in the pricing of deposit insurance, please refer to the appendix.

owners, because they reduce the equity buffer of a bank leaving the riskier assets on the balance sheet (Acharya *et al.*, 2009).

Capital requirements should counteract this type of moral hazard because they force banks to internalise the adverse consequences of excessive risk taking. However, capital requirements reduce franchise values (that is, the present value of expected future profits of the bank as a going concern) because they bring about a higher cost of capital (Hellmann *et al.*, 2000). When franchise values are high, banks have an incentive not to risk bankruptcy, because bankruptcy would prevent bank owners from selling the franchise value (that is, the franchise value would be lost). When franchise values are low, however, banks have little to lose, and the incentive to gamble and exploit the deposit insurance scheme may be high. Therefore, banks should exploit the deposit insurance scheme only if the expected reduction in franchise value is lower than the increase in the value of the deposit insurance put option (Keeley, 1990).[6] The negative impact of capital requirements on franchise values may offset the ability of capital requirements to reduce risk taking, especially in competitive environments where franchise values are low (Keeley, 1990; Hellmann, 2000). Moreover, minimum capital requirements could be circumvented by practices of capital management (Collins *et al.*, 1995) and the use of hybrid instruments (Acharya *et al.*, 2009).[7] An additional issue with capital adequacy regulation is pro-cyclicality in loan loss provisioning: capital requirements become stricter during periods of economic contraction, and exacerbate recessions (Borio *et al.*, 2001; Laeven and Majnoni, 2003; Beatty and Liao, 2009).

Despite the importance of dividend policy for bank risk, this topic has been overlooked by the literature. Bessler and Nohel (1996, 2000) and Cornett *et al.* (2008) focus on the signalling content of dividends. Casey and Dickens (2000) and Casey *et al.* (2002) investigate the determinants of the dividend payout ratio and dividend yield, respectively. Boldin and Leggett (1995) investigate the relation between dividends and bank rating. These studies focus on US banks only and provide mixed results as to how dividends relate to bank risk.

[6] For instance, the Savings and Loans (S&L) crisis occurred in the 1980s has been ascribed to competition (driven by deposit rate deregulation), which caused a decline in the franchise value of the S&L. In such circumstances, banks were incentivised to increase the put option implied by the deposit insurance scheme (Keeley, 1990).

[7] 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 the assets is lower than that of the 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 up 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.

In this paper, I investigate the relationship between risk and dividends in banks, and in particular I examine the possibility that dividends exacerbate moral hazard by allowing risk-shifting from bank owners to debt holders and the taxpayer. The banking literature commonly employs the Z-score as a measure of default risk (Boyd and Graham, 1988). The Z-score is a ratio whose numerator is the sum of a profitability measure (such as the Return on Assets)[8] and equity to total assets, while the denominator is the standard deviation of the profitability measure (see table 1). Given the importance of equity for banks, the Z-score is a more reliable measure for risk than the standard deviation of accounting returns alone. Recent literature employs the natural logarithm of the Z-score because the Z-score is highly skewed, while the log of the Z-score is normal (Laeven and Levine, 2009).

As an alternative measure of bank risk, the extant literature has widely employed the ratio loan loss provisions to total loans (Altunbas *et al.*, 2009; Altunbas *et al.*, 2007; Iannotta *et al.*, 2007; Nier and Baumann, 2006). However, this measure reflects only a specific type of risk (credit risk) and suffers from two drawbacks. First, loss provisioning tends to be backward looking, because most banks do not recognise future loan losses timely (Beatty and Liao, 2009). Therefore, loan loss provision ratio can at best be 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).[9] Moreover, banks may manipulate the loan loss provision for purposes of income-smoothing, although the empirical evidence is mixed (Collins et al., 1995; Ahmed et al., 1999). Therefore, the ability of the loan loss provision to proxy for credit risk may be impaired by practices of earnings management. For these reasons, I do not employ this ratio as a proxy for risk, and I allow for possible earnings manipulation by adjusting profits for changes in loan loss provisions.

On the grounds of the impact of deposit insurance regulation on the pricing of a bank's assets, the main hypothesis tested in this paper is as follows:

H_1: Risk-shifting hypothesis

According to the risk-shifting hypothesis (henceforth, H_1) banks with a high default risk are incentivised to increase dividends. Deposit insurance regulation incentivises excessive risk-taking, and dividends help transfer this risk to the taxpayer. Dividends reduce the overall value

[8] Researchers have also used market returns rather than accounting returns (De Nicoló, 2000).
[9] It may be argued that loan loss provisioning should be *forward looking*, and therefore its use as a proxy for ex-post risk is inadequate. However, most banks do not recognise future loan losses timely, and therefore the loan loss provisioning is *backward looking* (Beatty and Liao, 2009).

of the assets debt holders can claim in the case of liquidation, and therefore reduce the value of debt. Because equity holders are the recipient of dividends, dividends do not affect the value of equity (equity is 'dividend protected', Ronn and Verma, 1986). Therefore, dividends effectively shift bankruptcy risk from bank owners to debt holders and, via the deposit insurance scheme, to the taxpayer.[10] I test H_1 by assessing the influence of the log of the Z-score[11] on the dividend payout ratio. According to H_1, there should be a negative relationship between the log of the Z-score and the dividend payout ratio.

A corollary of my risk-shifting hypothesis is that capital ratio should be negatively related to dividends, while returns volatility should be positively related to dividends.

According to Keeley (1990) deposit insurance regulation may lead to lower risk-taking because it may increase the charter value of insured banks, which would be lost in the case of a default. Any type of government guarantee would ensure lower refinancing costs to protected banks, leading to higher charter values (Gropp *et al.*, 2010). These considerations lead to the following hypothesis:

H_2: Charter value hypothesis

Default risk is negatively related to dividends. The positive effect of government guarantees on charter values deters banks from excessive risk taking, because a default would result in the loss of the charter value. Because dividends, ceteris paribus, decrease the Z-score, high default risk should act as a deterrent for large dividend payments. In other words, dividends are an opportunity cost for banks with low Z-score: while they transfer wealth from the bank to the shareholders, they also increase the probability that the shareholders lose the bank's charter value. I name H_2 the 'charter value' hypothesis.

To reduce bank risk-taking, bank regulators have introduced capital requirements. Capital adequacy regulation impinges on bank charter values, and consequently on bank risk taking (Hellmann *et al.*, 2000). Capital adequacy regulation may reduce charter values up to a point for which banks are not worried about losing it, and take excessive risk. Therefore, capital requirements could lead to a positive relationship between dividends and default risk (H_1).

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[10] As explained in the introduction, capital adequacy regulation may not be enough to prevent moral hazard (Acharya *et al.*, 2009; Hellmann *et al.*, 2000).

[11] The literature on dividend policy of nonfinancial firms employs measures of risk such as the beta (Rozeff, 1982), or the standard deviation of residuals from a regression of daily stock returns on returns of the market portfolio (Hoberg and Prabhala, 2009; Li and Zhao, 2008). Other measures of risk are the standard deviation of stock returns or the residuals of a regression of excess returns on the three Fama and French (1992) factors.

However, because capital requirements force bank owners to bear a large part of the negative consequences of a default, they should reduce moral hazard deriving from deposit insurance regulation. Under capital adequacy regulation, banks with a low capital ratio may not be able to achieve the risk-return objectives of their investment policy, and large dividend payments may be discouraged.

H_3: Opportunity cost hypothesis

Capital ratio is positively related to dividends. Capital adequacy regulation may reduce the incentives to pay dividends deriving from deposit insurance regulation and other types of government guarantees. Ceteris paribus, dividends constrain the ability of a bank to increase common equity capital, potentially leading to rejection of profitable projects. Therefore, in the presence of capital adequacy regulation, dividends are an opportunity costs for banks with low capital ratios. I name H_3 the 'opportunity cost' hypothesis.

3. Methodology and data

3.1 Methodology

I investigate the nexus between dividends and risk using the several econometric models: OLS model, panel data models with fixed effects, and dynamic panel data models. Previous literature on the determinants of payout ratios uses dividends/earnings as a dependent variable (Rozeff, 1982). However, this ratio becomes infinite when earnings are zero, and for negative large dividends cause the payout ratio to fall instead of increase. This inverse relation between dividends and the payout ratio is counterintuitive. Using equity rather than earnings in the denominator avoids these two problems. I prefer equity to other possible variables such as total assets given the importance of equity capital in banking.[12]

The specification of the model is as follows:

$$Y_{it} = \alpha + \rho Y_{it-1} + \boldsymbol{\beta}'\mathbf{x_{it}} + \varepsilon_{it} \qquad (2)$$

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

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

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

where *i* indexes observational units and *t* indexes time. Y_{it} is the ratio dividends to equity (DPE). $\boldsymbol{\beta}$ and $\boldsymbol{\gamma}$ are vectors of coefficients, $\mathbf{x_{it}}$ is a vector of covariates, including variables

[12] In recent literature for nonfinancial firms, dividends have been scaled by revenues (Khan, 2006).

proxying for risk (log of the Z-score, equity to total assets, standard deviation of ROA) and controls. The error term ε_{it} consists of an unobserved panel-level effect η_i (fixed for each bank *i*), and the idiosyncratic component v_{it} (i.i.d. 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. The reasons are as follows. OLS should lead to inconsistent and biased estimates in panel data because of lack of independence between the covariates and the panel-level effect, $E(\mathbf{z_{it}}, \eta_i) \neq 0$, where $\mathbf{z_{it}} = (Y_{it-1}, \mathbf{x_{it}})$. The fixed-effect panel data model (FEM) provides consistent estimates for cases where the covariates are correlated with the panel-level effects, $E(\mathbf{x_{it}}, \eta_i) \neq 0$, because it eliminates η_i by subtracting the time mean of (2) from (2) itself. However, this technique results in $E(Y_{it-1}, v^*_{it}) \neq 0$, where $v^*_{it} = v_{it} - v_i$ (Nickell, 1981). In other words, FEM is consistent (but less efficient than the alternative Generalised-Least-Squares estimator, which assumes $E(\mathbf{x_{it}}, \eta_i) = 0$), in cases where:

$$Y_{it} = \alpha + \boldsymbol{\beta}'\mathbf{x_{it}} + \boldsymbol{\gamma}'\mathbf{c_{it}} + u_{it} \tag{3}$$

$$u_{it} \sim N(0,\sigma^2)$$

If the generation process for Y_{it} is (2) instead of (3), regressing Y_{it} on $\mathbf{x_{it}}$ and $\mathbf{c_{it}}$ will result in an autoregressive error term, $u_{it} = \rho u_{it-1} + v_{it}$.

The 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 FEM), and allows for $E(Y_{it-1}, v^*_i) \neq 0$ using the lags of Y_{it} as instruments. While Arellano and Bond (1991) estimator (GMM-DIF) employs only lagged levels of Y_{it} as instruments in the first-differenced equation, Blundell and Bond (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} 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 (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.

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

3.2 Definition of the explanatory variables

Table 1 defines the explanatory variables used in my econometric models.

My proxies for risk are the log of the Z-score, the capital ratio (equity/total assets) and the standard deviation of ROA (SDROA, ROA volatility). To avoid multicollinearity, the equations with the log of the Z-score as proxy for bank risk are run separately from those with the capital ratio and ROA volatility.

The extant literature finds that agency costs, loans growth, size, and profitability influence the dividend payout ratio. Accordingly, I include several control variables in equation (2) to account for the impact of these factors.

Insiders-Outsiders (IO) conflict. In the U.S., the agency problem mainly refers to the conflicting interests of managers and shareholders. In Western Europe, where many corporations and banks are not publicly held, insider shareholders are so close to the management that the crucial agency problem is between insiders (managers and large shareholders) and outsiders (Faccio *et al.*, 2001). Where share ownership is widely dispersed, there is a free-rider problem that discourages outsiders' monitoring of insiders (Grossman and Hart, 1980). The conflict between insiders and outsiders may be reduced by paying dividends (Easterbrook, 1984; Jensen, 1986). This 'monitoring rationale' is one of the reasons why dividends are paid.[13] I use three proxies for the degree of agency costs. The number of recorded shareholders, and the listing on a stock exchange should be positively related to shareholders dispersion, and should therefore be positively correlated with the level of agency costs. However, quotation on a stock exchange may act as a monitoring device for shareholders (Easterbrook, 1984). Thus, the expected coefficient on a dummy variable (1 if a bank is listed and 0 otherwise) may be positive or negative (or insignificant). In addition to the two foregoing proxies, I employ BankScope 'independence indicator' as a proxy for insiders' influence. I construct three dummies, IND1, IND2, and IND3, to proxy for the importance of the main shareholder. IND1 is an indicator variable taking the value 1 if there is no shareholder with more than 25% of voting rights, and 0 otherwise. IND2 is an indicator variable taking the value

[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 may lose their monitoring function (Noronha et al., 1996). This may occur when there is a large outsider shareholder whose incentive to monitor insiders is high (Shleifer and Vishny, 1986), or when the interests of insiders and outsiders are aligned (for example, in the presence of performance-related compensation packages for managers). For nonfinancial firms, loan intensity from relationship banks increases monitoring and decreases payout ratios (Allen et al., 2009). In banking, regulation may provide an alternative monitoring device for outsiders (Filbeck and Mullineaux, 1999).

1 if there is a shareholder with more than 25% of total ownership, but no shareholder with more than 50% of total ownership, and 0 otherwise. IND3 is an indicator variable taking the value 1 if there is a shareholder with more than 50% of total ownership, and 0 otherwise. To avoid perfect collinearity, I insert only IND1 and IND3 in my regressions. IND1 (IND3) indicates the highest (lowest) degree of ownership dispersion. Dividends should be positively related to the severity of the IO conflict. Therefore, if dividends are positively related to agency costs the coefficients on IND1 should be positive, while that on IND3 should be negative. Because these variables are listing, the number of recorded shareholders and the independence indicator are included one at a time in my multivariate analysis.

Loans growth. Studies on nonfinancial firms find that growth constrains the ability of a firm to distribute dividends (Fama and French, 2001; Rozeff, 1982). Literature on banks uses loans growth as a proxy for growth (Casey and Dickens, 2000). I expect a negative coefficient on loans growth because banks that are growing rapidly are likely to retain more cash than banks that lack growth opportunities.

Size (log of assets). According to studies on nonfinancial firms, small firms are less likely to distribute dividends than large banks (Denis and Osobov, 2008; DeAngelo *et al.*, 2004; Fama and French, 2001). As a proxy for size, DeAngelo *et al.* (2004), and Fama and French (2001) use the percentage of NYSE firms with the same or lower market capitalization. Denis and Osobov (2008) employ the book value of assets. I employ the log of assets as a proxy for size, similar to other studies in the banking literature (e.g. Gropp and Heider, 2010).

Profitability. According to studies on nonfinancial firms, profitability is positively related to dividends (Denis and Osobov, 2008; DeAngelo *et al.*, 2004; Fama and French, 2001). As a proxy for profitability I employ the Return on Assets (ROA), net of loan loss provisions, and I expect a positive coefficient on ROA. It has been suggested that some banks 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 ability of the loan loss provision to proxy for credit risk may be impaired by practices of earnings management. A large variability in bank profitability can be reduced by inflating the loan loss provision when earnings are high, and reducing the loan loss provision when earnings are low. To allow for earnings management, I calculate ROA as the sum of net income and loan loss provisions, divided by total assets. To avoid multicollinearity, ROA is excluded from regressions where the Z-score is also present.

Earned equity. DeAngelo *et al.* (2006) find that the proportion of equity that consists of retained earnings (or earned equity) explains dividend payments, supporting the life-cycle theory of dividends. When most of the equity capital is earned rather than contributed dividend payments are more likely. The ratio retained earnings to equity (RETE) is found to increase the likelihood that a dividend is paid in U.S. nonfinancial firms. However, von Eije and Megginson (2006) do not find a significant relationship between RETE and dividends in Europe. In banking, retained earnings may be more important than in nonfinancial firms to accumulate enough equity capital. Banks may be willing to forego the benefits on dividends (for example, signalling) because of the importance of a solid capital buffer for their reputation, and to stave off regulatory interventions. In accordance with the findings for non-financial firms, I expect a positive coefficient on RETE.

Initial Public Offerings. Recent studies in the corporate finance literature find that dividend policy may be affected by recent flotation on the stock market (Cornett et al., 2008). Banks that have just gone public are more likely to initiate dividends than post-IPO nonfinancial firms (Cornett et al., 2008). Therefore, I expect a positive coefficient on a dummy equal to 1 if a bank went public during the sample period.

Country and year effects. Given the multi-country nature of my study, I also control for possible country effects. 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 a 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.[14] I use a dummy variable, 1 if the bank headquarters are located in the U.S. and 0 if they are in Europe. If in the U.S. the protection of minority shareholders' rights is stronger than in Europe, the outcome model predicts that the coefficients on the dummy should be positive. Year dummies are included to allow for changes in dividends due to changes in the macroeconomic environment over time.

A more detailed explanation of the covariates that comprise the vectors $\mathbf{x}_{it}$ and $\mathbf{c}_{it}$ is provided in table 1.

[Insert Table 1 here]

[14] An alternative to the outcome model is the substitute model: in countries with weak legal protection for minority shareholders, companies use dividends as a means to establish a reputation. The substitute model predicts higher dividends for countries with weak legal protection for minority shareholders (La Porta *et al*., 2000).

3.3 Data

I collect consolidated bank accounts data for 746 banks (Bank Holding Companies (BHC), commercial banks, cooperative banks, or savings banks) located either in the U.S. or in the European Union (27 countries) from the Bureau Van Dijk *Bankscope* database. The sample period is 2000 to 2008. Table 2 summarises the construction of the sample.

[Insert Table 2 here]

Table 3 reports the sample composition. The majority of the institutions in the sample are BHC (52%), followed by commercial banks (38%). Most of the banks are located in the U.S. (59%). The majority of the U.S. sub-sample consists of BHC (81%, for the EU only 10%), while the majority of the EU sub-sample comprises commercial banks (65%, only 18% for the U.S.). There are only 3 mutual banks for the U.S. (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 (2282 out of 2967) pertain to U.S. institutions, and around 59% of them pertain to listed institutions.

Table 3 also reports descriptive statistics for the continuous explanatory variables. All the statistics in table 3 are reported after winsorization at the 1st and 99th percentile. EU banks are riskier (in terms of lnZ, capital ratio, and ROA volatility) than U.S. banks. Annual growth in loans is significantly larger for EU banks (almost twice as big as for U.S. banks). U.S. banks are more profitable and hold a higher percentage of retained earnings to total equity capital. However, U.S. banks are on average smaller than those in the EU sub-sample. The average DPE does not significantly differ between the two sub-samples. Overall, it appears than during 2000-2008 EU banks were (according to accounting-based measures) riskier than U.S. banks, and were increasing their lending supply. However, this does not necessarily mean that the actual riskiness of the investment portfolios of EU banks was higher than for U.S. banks. In particular, our data do not consider differences in off-balance sheet items (especially those related to securitisation), which have played an important role in the 2007-2009 financial crisis.

Listed banks pay less dividends (as a percentage of equity) than unlisted banks. This result supports the hypothesis that quotation on a stock exchange may substitute dividends as a monitoring device. Listed banks exhibit lower default risk (proxied by lnZ), although they tend to bear less capital as a percentage of total assets. The reason for the higher default risk for unlisted banks may be a higher ROA volatility. Listed banks are on average smaller than unlisted banks. The reason for this unexpected result may be the positive correlation between the country of origin of the bank and the decision to go public. Around 82% of the listed banks in my sample are from the U.S. This may suggest that U.S. banks are more inclined to go public than EU banks. Banks in the U.S. sub-sample are on average smaller than those in the EU sub-sample, and this may cause the negative correlation between quotation and size.

[Insert Table 3 here]

Table 4 reports the Pearson correlations for the dependent and the continuous explanatory variables. Like for table 3, all the statistics reported in table 4 are reported after winsorization at the 1^{st} and 99^{th} percentile. Consistent with a risk-shifting hypothesis, DPE is negatively correlated with lnZ and the capital ratio, and positively correlated with ROA volatility. Consistent with previous studies on the dividend policy of nonfinancial firms, DPE is negatively correlated to growth, and positively correlated to retained earnings to equity, profitability and size (Denis and Osobov, 2008; DeAngelo et al., 2004; Fama and French, 2001). The relationships among the explanatory variables are also consistent with expectations. LnZ is positively correlated to the capital ratio and negatively related to ROA volatility. The capital ratio and ROA volatility are positively correlated, which may be a consequence of capital adequacy regulation (banks with low asset quality are expected to hold more capital). Small banks are more profitable than large banks and tend to hold more capital, consistent with Ayuso *et al.* (2004), Alfon *et al.* (2004), and Flannery and Rangan (2004). A negative relationship 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 equity capital in the stock market more easily than small banks. Moreover, lower capital buffers for large banks may indicate that they enjoy implicit government guarantees. Not only do small banks hold more capital as a percentage of total assets, they also exhibit lower ROA volatility, and as a result their Z-scores are also larger on average. Finally, profitability, the capital ratio, and retained earnings to 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 regression results of my econometric models. For consistency with the results of the univariate analysis reported in tables 3 and 4, the econometric analysis is carried out after winsorization at the 1^{st} and 99^{th} percentile of all variables.

Table 5 reports estimation results for the OLS, FEM and GMM-SYS models when lnZ is considered as proxy for risk. Each model is run according to three different specifications. For all specifications, lnZ is negatively related to DPE. For the OLS specifications, the coefficients are insignificant. For FEM, the coefficients on the first lag of the dependent variable are negative. This result may be due to the downward bias of the FEM estimator when the dependent variable is autocorrelated (Khan, 2006; Nickell, 1981). In the GMM-SYS specifications, I allow for endogeneity with respect to default risk: dividend policy and default risk may both be a consequence of unobserved factors relating to managerial decisions. The diagnostic statistics for GMM-SYS are consistent with the assumptions of this econometric model. In particular, the Sargan test does not reject the hypothesis of validity of the instruments. For all three cases pertaining to GMM-SYS, the coefficients on lnZ (and on the first lag of lnZ) are negative and significant. These results support the risk-shifting hypothesis, while are contrary to the charter value hypothesis.

With regard to the control variables, the results for loans growth and RETE are consistent with the findings reported in the literature about nonfinancial firms. The results for size change according to the specification employed, and they are insignificant for all three GMM-SYS specifications. The results for IPO are significant only in 2 cases (GMM-SYS), and they are contrary to those found for the nonfinancial literature. In this case, it may be interesting to investigate whether these results differ because of the econometric model employed (GMM-SYS). The results for listing are consistent with the results for the univariate analysis: a negative coefficient supports the hypothesis that quotation on a stock exchange may substitute dividends as a monitoring device. The coefficients for IND3 change sign according to whether OLS or GMM-SYS is employed. The sign of the coefficient for GMM-SYS is consistent with expectations. The change in the direction of the relationship for certain explanatory variables justifies the use of a dynamic panel data model. In other words, using the correct specification is essential, and the contribution is not merely methodological. The results for the number of recorded shareholders, and the dummies IND1 and U.S. (apart from one case) are insignificant.

Table 6 reports estimation results for the OLS, FEM and GMM-SYS models when the capital ratio and ROA volatility are considered as proxy for risk. Each model is run according to three different specifications. I allow for endogeneity with respect to the capital ratio and ROA volatility (SDROA). The rationale is that managers make decisions about the level of risk taking and dividends simultaneously. The diagnostic statistics for GMM-SYS are consistent with the assumptions of this econometric model. In particular, the null hypothesis that the instruments are valid is not rejected by the Sargan test. For all specifications, the coefficients on the capital ratio are negative and significant, supporting the risk-shifting hypothesis and rejecting the opportunity cost hypothesis.[15] The coefficients on SDROA are positive and significant for the OLS and FEM specifications, while for the GMM-SYS specifications they are insignificant at conventional levels. However, the lag of SDROA is positive and significant for all three GMM-SYS specifications, suggesting that risk positively influences future dividends. This is consistent with the risk-shifting hypothesis.

With regard to the control variables, the coefficients for ROA are positive and significant for all specifications, consistent with expectations. The results for the other control variables are similar to those reported in table 5, apart from RETE, for which the coefficients are either insignificant (for the OLS and GMM-SYS regressions) or negative. For the preferred specifications (GMM-SYS), the results are very similar to those reported in table 5: the coefficients are all negative and significant for loans growth, insignificant (in 2 cases out of 3) for size, negative and significant for IPO, and listing. For size, the results may be insignificant due to sample selection bias: variables such as RETE may be available only for large banks.

Overall, my results support the risk-shifting hypothesis, while they do not support either the charter value or the opportunity costs hypotheses.

[Insert tables 5 and 6 here]

6. Conclusions and policy recommendations

In this paper, I have investigated the interplay between dividends and bank risk. Dividends may 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 scheme, to the taxpayer. Capital requirements should help reduce moral hazard deriving from the deposit insurance scheme and other types of government guarantees. However, capital adequacy regulation may backfire because it could lead to lower franchise values and higher incentives to gamble for bank owners. Moreover, the effectiveness of capital adequacy regulation can be impaired by practices of capital management and the use of hybrid instruments.

I find a positive relationship between default risk and dividends, consistent with my hypothesis that dividends may be used as a risk-shifting device for banks with high default risk. However, I also find evidence that capital regulation may not be able to reduce this type of moral hazard behaviour: banks with lower capital ratios tend distribute more dividends. These

[15] These results obtain even when the regulatory total capital ratio (regulatory capital to total risk-weighted assets) is employed in place of equity to total assets.

results are not consistent with the view that capital adequacy is enough to reduce potential moral hazard behaviour by imposing opportunity costs on dividends for banks. Moreover, I provide some evidence of a positive relationship between returns volatility and dividends. These results suggest that capital adequacy regulation (in particular, the framework commonly referred to as Basel I) may not fully capture bank risk, or that the influence of this type of regulation on dividends is not as strong as it would be advisable.

The findings of this paper have important policy implications. The current debate on whether dividends should be curbed in banks that are not financially sound or with liquidity problems can draw further insights from my analysis. My results support recent proposals (Basel III) regarding the need to constrain dividends when capital ratios are close to the regulatory minimum. Restrictions of dividends payments may also be coordinated with complementary measures including, for instance, issuance of new common equity capital.

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Appendix

Analytical explanation of the relationship between the value of common equity, dividends, and risk

In this appendix I give a brief account of the models by Merton (1974, 1977) on the pricing of corporate debt and of the cost of deposit insurance, and how they relate to dividend payments and risk. For details regarding the models, I refer the reader to Merton (1974, 1977), and Ronn and Verma (1986).

The model on the pricing of corporate debt developed by Merton (1974) is based on the isomorphic relation between common equity of a levered firm and a common stock call option. The model on the pricing of deposit insurance developed by Merton (1977) relies upon the isomorphic relation between loan guarantees and common stock put options, and can be applied to any guarantee of a third party on behalf of the borrower, such as guarantees of a parent company for a loan made by a third party to one of its subsidiaries.

Assume that the value of assets of a bank at time t (A_t) follows a Geometric Brownian motion:

$$d\,ln(A_t) = \mu dt + \sigma dW_t \quad \text{(A1)}$$

where μ is the instantaneous expected return on assets, σ is the instantaneous standard deviation of returns, and W_t is a Wiener process. The payoff of a European call option with strike price X on the expiration date, t^*, is the greater between 0 and the difference between A_{t*} and X, or MAX[0, A_{t*} – X], while the payoff of a European put option is MAX[0, X – A_{t*}]. In a frictionless market, the 'no arbitrage opportunities' condition (Black and Scholes, 1972) holds:[16]

[16] The 'no arbitrage opportunities condition' states that '[…] in equilibrium a riskless hedge cannot yield a return greater than the short term interest rate in the market, the option must be priced such that market participants could not establish this hedge and expect to realize a sure profit.' (Black and Scholes, 1972, p.400).

$$C_t = A_t N(d_1) - Xe^{-rT} N(d_2)$$

$$d_1 = [ln(A_t/X) + (r + 0.5\sigma^2)\,T] / \sigma T^{0.5}$$

$$d_2 = d_1 - \sigma T^{0.5} \quad \text{(A2)}$$

$$P_t = C_t + Xe^{-rT} - A_t \quad \text{(A3)}$$

Where C_t is the price of the call option (for one share), P_t is the price of the put option (for the same share), r is the short-term rate of interest, T is the duration of the option (time to expiration), and N(.) is the value of the cumulative distribution function of the standard Normal distribution. According to Merton (1977), the face value of debt of a corporation, D, can be seen as the strike price of a call, or X in equation (A2). In such circumstances, the equity value of the bank, E_t, can be calculated using:

$$E_t = A_t N(d_1) - De^{-rT} N(d_2) \quad \text{(A4)}$$

where D is the face value of debt.

The cost of deposit insurance, G_t, can be modelled according to (A3), but with an adjustment to consider the fraction of the bank liabilities that consists of insured deposits, $\eta = D_1/D$. If all pre-insurance debt is of equal seniority, depositors (in the absence of deposit insurance) will receive the lower between the future value of deposits, $FV(D_1)$, and the pro-rated fraction of the value of the total assets of the bank, $A_t\eta$. The payoff generated by the deposit insurance at maturity is $MAX[0, FV(D_1) - A_t\eta]$ (Ronn and Verma, 1986). The deposit insurance premium can be modelled as follows:

$$G_t = N(h_2) - (1 - \delta)(A_t/De^{-rT})N(h_1)$$

$$h_1 = \{ln[D/A_t(1 - \delta)] - T(r + 0.5\sigma^2)\} / \sigma T^{0.5}$$

$$h_2 = h_1 + \sigma T^{0.5} \quad \text{(A5)}$$

where G_t is the premium of the deposit insurance per each dollar of insured deposits, equivalent to the value of a put with a strike price equal to total debt (D) divided by D_1, δ is the dividend per dollar of A_t, assuming that dividends are paid once for each period. Equation (A5) shows that, ceteris paribus, a larger δ increases G_t because it decreases A_t. Note that in equation (A4) dividends do not decrease the value of equity because equity is dividend-protected (Ronn and Verma, 1986). If deposit insurance exists in the banking system, banks that pay dividends can increase the value of deposit insurance by paying dividends. Banks are also incentivised to increase the debt-to-assets ratio, because this decreases A_t/De^{-rT}.

The value of a debt in a leveraged bank which pays dividends is:

$$F_t = De^{-rT} [N(f_2) + (1 - \delta)(A_t/De^{-rT})N(f_1)]$$

$$f_1 = - \{0.5\sigma^2 T - \ln[De^{-rT}/ A_t(1 - \delta)]\} /\sigma T^{0.5}$$

$$f_2 = - \{0.5\sigma^2 T + \ln[De^{-rT}/A_t(1 - \delta)]\} /\sigma T^{0.5} \quad \text{(A6)}$$

Therefore, dividends reduce the value of bank assets and the overall amount that debt holders can claim in the event of liquidation. Dividends reduce the value of debt because debt, unlike equity, is not dividend-protected. Given the face value of uninsured debt, $D_2 = D - D_1$, dividends decrease the probability that uninsured debt holders will be repaid if the bank collapses. Assume that, in the event of a default, all insured depositors are paid by the deposit insurance scheme,[17] so that uninsured debt holder can claim the total of the assets of the bank, A_t. Then, the future value of uninsured debt for banks that do not pay dividends is:

$$FV(D_2) = \min[A_t, D_2] \quad \text{(A7)}$$

For banks that pay dividends, the future value of uninsured debt is:

[17] In such conditions, the option component of equity disappears, and the market value of insured debt becomes the no-default risk value (Gropp *et al.*, 2004).

$$FV(D_2)^* = \min[(1 - \delta)A_t, D_2] \quad (A8)$$

Note that for any $\delta > 0$, if $(1 - \delta)A_t < D_2$, then $FV(D_2)^* < FV(D_2)$. Paying dividends benefits common shareholders because they receive cash while debt holders do not, and dividends reduce the probability that uninsured debt holders will be paid in full. This effect is stronger for banks for which D_2 is large. As D_2 increase (for instance, because of the issuance of hybrid instruments, as in Acharya *et al*, 2009), $De^{-rT}N(d_2)$ in equation (A4) approaches $A_tN(d_1)$, and $E_t \rightarrow 0$. Therefore, banks may increase the debt-to-assets ratio to increase G_t (to the extent that this is allowed by capital adequacy regulation), but in so doing the value of equity would decrease, as it would be for a call option with a larger strike price.

Banks with $E_t \rightarrow 0$ may attempt to increase E_t by increasing business risk, which in the BS-model can be represented by σ (Merton, 1973). More risk increases the payoff of a call option conditional on the option being exercised. This can be easily shown taking the first derivative of (A4) with respect to σ (also called Vega):[18]

$$\partial E_t/\partial\sigma = A_t n(d_1)T^{0.5} \quad (A9)$$

Where n(.) is the probability density function of the standard Normal distribution. Given that $A_t \geq 0$, $n(d_1) \geq 0$, and $T^{0.5} \geq 0$, it follows that an increase in business risk brings about a higher value of E_t. What is the impact of business risk on the current value of debt, F_t? As shown in Merton (1974), $F_t = A_t - E_t$. Therefore, there is a negative relation between F_t and E_t. Due to the positive relation between σ and E_t (equation A9), it follows that F_t is negatively related to σ, i.e. an increase in business risk decreases the current value of the debt (see also Merton, 1974, p. 455). Therefore, as said in the introduction, ceteris paribus dividends and the issuance of debt decrease the capital ratio and incentivise risk taking.

[18] For a derivation of (A9), please refer to Garven (2009), pp. 13-14.

Table 1 Explanatory variables definitions.

Capital ratio (CR)	total equity to total assets of bank i in year t.
Profitability (ROA net of loan loss provisions)	net income of bank i in year t plus loan loss provision of bank i in year t dividend by total assets of bank i in year t. I prefer ROA to ROE (Return On Equity) because ROE does not take into account the effect of leverage on profitability and risk.
SDROA (ROA volatility)	Standard deviation of ROA (net income on average total assets) for bank i in tear t, calculated using a 3-year moving average for t-1, t, and t+1: $SDROA_{it} = \sqrt{\frac{1}{T-1}\sum_{t=-1}^{t+1}(ROA_{it} - \overline{ROA_i})^2}$ where $\overline{ROA_i} = \frac{1}{T}\sum_{t=-1}^{T-2} ROA_{it}$ and T = 3.
lnZ	natural logarithm of the Z-score, calculated as the ROA of bank i in year t plus the equity to total assets of bank i in year t divided by ROA volatility: $lnz_{it} = \ln(Z_{it}) = ln[(ROA_{it} + E_{it} / TA_{it}) / SDROA_{it}]$ where E_{it} is total equity and TA_{it} is total assets of bank i in year t.
Earned equity (RETE)	retained earnings of bank i in year t dividend by the total equity of bank i in year t
Recorded shareholders	number of recorded shareholders in 2009+.
Listed bank	1 if bank i is listed on the stock market in year t and 0 otherwise.
IND1	1 if there is no shareholder with more than 25% of total ownership in 2009+ and 0 otherwise.
IND2	1 if there is a shareholder with more than 25% if total ownership but no shareholder with more than 50% of total ownership in 2009+ and 0 otherwise.
IND3	1 if there is a shareholder with more than 50% of total ownership in 2009+ and 0 otherwise.
Loans growth	average annual % rate of growth in loans of bank i between years t-1 and t.
Size	log of assets of bank i in year t.
Initial Public Offerings	1 if bank i went public during 2000-2008, and 0 otherwise

+ 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.

	Search criterion	Number of banks
Step 1	Geographic: U.S. and European Union (27)	25,104
Step 2	Specialisation: Bank Holding Companies (BHC), 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 Sample composition and main descriptive statistics.

		U.S.	EU	Listed	Unlisted	ALL
Sample composition	All Banks	440	306	398+	355	746
	BHC	357	29	289+	100	386
	Commercial	80	200	89+	195	280
	Cooperative	1	44	16	29	45
	Savings	2	33	4	31	35
DPE	Obs	2282	685	1737	1230	2967
	Mean	0.0446	0.0485	0.0429[b]	0.0492[b]	0.0455
	SD	0.0440	0.0490	0.0300	0.0603	0.0452
	p50	0.0363	0.0328	0.0399	0.0257	0.0359
	p1	0.0000	0.0000	0.0000	0.0000	0.0000
	p99	0.2222	0.2425	0.1523	0.2425	0.2425
lnZ	Obs	2282	685	1737	1230	2967
	Mean	4.2997[a]	3.7791[a]	4.2767[b]	4.0422[b]	4.1795
	SD	0.9370	1.0210	0.9390	1.0238	0.9817
	p50	4.3074	3.7776	4.2808	4.1114	4.2029
	p1	1.6748	1.6748	1.8810	1.5292	1.6748
	p99	6.5961	6.6341	6.5867	6.6265	6.5961
Capital Ratio	Obs	2282	685	1737	1230	2967
	Mean	0.0972[a]	0.0754[a]	0.0909[b]	0.0939[b]	0.0921
	SD	0.0362	0.0421	0.0359	0.0423	0.0387
	p50	0.0912	0.0682	0.0887	0.0864	0.0878
	p1	0.0543	0.0264	0.0270	0.0264	0.0264
	p99	0.2259	0.2259	0.1787	0.2259	0.2259
SDROA	Obs	2282	685	1737	1230	2967
	Mean	0.0027[a]	0.0041[a]	0.0024[b]	0.0040[b]	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
Loans Growth	Obs	2282	685	1737	1230	2967
	Mean	0.1157[a]	0.2049[a]	0.1337	0.1399	0.1363
	SD	0.1722	0.2321	0.1569	0.2315	0.1914
	p50	0.0950	0.2215	0.1085	0.1171	0.1116
	p1	-0.3222	-0.3222	-0.2316	-0.3222	-0.3222
	p99	0.6897	0.6897	0.6654	0.6897	0.6897
Earned equity	Obs	2282	685	1737	1230	2967
	Mean	0.5090[a]	0.3948[a]	0.4900	0.4722	0.4826
	SD	0.3158	0.2886	0.2968	0.3353	0.3134
	p50	0.5173	0.3772	0.5007	0.4707	0.4839
	p1	-0.1890	-0.0377	-0.0377	-0.4238	-0.1681
	p99	1.1391	0.9508	1.1391	1.0377	1.1329
ROA (net of loan loss provisions)	Obs	2282	685	1737	1230	2967
	Mean	0.0135[a]	0.0119[a]	0.0129	0.0134	0.0131
	SD	0.0076	0.0083	0.0069	0.0088	0.0078
	p50	0.0125	0.0105	0.0122	0.0121	0.0122
	p1	0.0011	0.0010	0.0012	0.0000	0.0011
	p99	0.0497	0.0465	0.0360	0.0497	0.0497
Size (log of assets)	Obs	2282	685	1737	1230	2967
	Mean	14.6065[a]	16.3658[a]	14.9005[b]	15.1710[b]	15.0126
	SD	1.5618	2.2048	1.8169	1.9630	1.8833
	p50	14.3873	16.2098	14.4746	14.9261	14.6206
	p1	12.1196	11.9736	12.5183	11.9736	11.9736
	p99	20.1284	20.8170	20.8170	20.4640	20.7426

Notes: All the statistics are shown for banks for which the payout ratio (dividends/equity), and the other explanatory variables (including the first lag of the payout ratio) are available. All the statistics are calculated after winsorization at the 1st and 99th percentile for all variables.

+ Seven banks went public or were delisted during the sample period (3 BHC and 4 commercial banks). For this reason, they appear as both listed and unlisted, causing the sum of the banks in the columns 'Listed' and 'Unlisted' to be 753, instead of 746.

a,b Denotes the two means are significantly different at the 5% level, according to a two-sample t-test with unequal variances.

Table 4 Pairwise correlations (continuous variables).

	DPE	lnz	Capital Ratio	ROA volatility	Loans Growth	Earned equity	Profitability
lnz	-0.0499***						
Capital Ratio	-0.0742***	0.0683***					
SDROA	0.0857***	-0.3807***	0.1574***				
Loans Growth	-0.0977***	0.0091**	-0.0704***	-0.0432**			
Earned equity	0.1003***	0.1425***	0.0063**	-0.0535***	-0.1388***		
Profitability	0.3058***	-0.0644***	0.4663***	0.1329***	-0.0407**	0.2208***	
Size	0.1135***	-0.1548***	-0.2532***	0.0177**	0.0894***	-0.0707***	-0.0253**

Notes: All the statistics are shown for banks for which the payout ratio (dividends/equity), and the other explanatory variables (including the first lag of the payout ratio) are available. All the statistics are calculated after winsorization at the 1st and 99th percentile for all variables. The correlations are calculated using 2969 observations.

* Denotes significance at the 10% level.

** Denotes significance at the 5% level.

*** Denotes significance at the 1% level.

Table 5: Estimation results for DPE (lnZ as a proxy for risk).

Dependent variable: Dividends/equity, DPE									
	OLS1	**OLS2**	**OLS3**	**FEM1**	**FEM2**	**FEM3**	**GMM1**	**GMM2**	**GMM3**
DPE(t-1)	0.0058***	0.0060***	0.0060***	-0.0045***	-0.0045***	-0.0045***	0.1698***	0.1598***	0.1779***
	(0.0019)	(0.0019)	(0.0019)	(0.0013)	(0.0013)	(0.0013)	(0.0130)	(0.0134)	(0.0134)
lnZ	-0.0004	-0.0006	-0.0004	-0.0019**	-0.0019**	-0.0019**	-0.0015**	-0.0017**	-0.0015**
	(0.0009)	(0.0009)	(0.0009)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
lnZ(t-1)							-0.0061***	-0.0082***	-0.0079***
							(0.0022)	(0.0024)	(0.0025)
Loans	-0.0318***	-0.0318***	-0.0329***	-0.0114***	-0.0112***	-0.0112***	-0.0109**	-0.0127***	-0.0123**
Growth	(0.0050)	(0.0050)	(0.0050)	(0.0038)	(0.0038)	(0.0038)	(0.0047)	(0.0049)	(0.0050)
RETE	0.0116***	0.0117***	0.0139***	0.0157***	0.0156**	0.0156**	0.0189**	0.0178**	0.0197**
	(0.0027)	(0.0028)	(0.0028)	(0.0061)	(0.0061)	(0.0061)	(0.0079)	(0.0084)	(0.0081)
Size	0.0027***	0.0028***	0.0022***	-0.0100***	-0.0099***	-0.0099***	-0.0033	0.0009	-0.0026
	(0.0005)	(0.0005)	(0.0005)	(0.0030)	(0.0030)	(0.0030)	(0.0034)	(0.0035)	(0.0037)
IPO	-0.0237	-0.0263	-0.0235	-0.0039	-0.0039	-0.0039	-0.0221*	-0.0251**	-0.0273**
	(0.0219)	(0.0219)	(0.0218)	(0.0150)	(0.0150)	(0.0150)	(0.0134)	(0.0128)	(0.0133)
Listing	-0.0050***			-0.0190**			-0.0210**		
	(0.0017)			(0.0090)			(0.0106)		
Recorded sh.ders		-0.0000						0.0007	
		(0.0000)						(0.0004)	
IND1			0.0019						-0.0258
			(0.0020)						(0.0175)
IND3			0.0112***						-0.0804**
			(0.0022)						(0.0324)
U.S.	-0.0019	-0.0025	-0.0016				-0.0420	-0.0489**	-0.0445
	(0.0022)	(0.0022)	(0.0022)				(0.0280)	(0.0229)	(0.0343)
Year effects	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Obs	2,967	2,967	2,967	2,967	2,967	2,967	2,313	2,313	2,313
Banks	746	746	746	746	746	746	670	670	670
m1							-4.326***	-4.362***	-4.380***
m2							-0.0770	-0.184	-0.114
Sargan							57.80	54.79	50.41
Sargan df							47	46	45

Notes:

Standard errors are reported in parentheses. OLS1-OLS3 are Ordinary Least Square regressions. FEM1-FEM3 are fixed-effects panel-data regressions. GMM1-GMM3, are systems of first-differenced and levels equations. DPE(t-1), and lnZ(t-1), denote the first lag of DPE, and lnZ, respectively. For the GMM specifications, the instruments used are: For DPE: Differenced equations: DPE(t-2),…,DPE(1). Levels equations: ΔDPE(t-1). For lnZ: Differenced equations: lnZ(t-3),…,lnZ(1). Levels equations: ΔlnZ(t-2). *m1* and *m2* are tests for absence of 1^{st} and 2^{nd} order autocorrelation in the first-differenced residuals, respectively. Under the null hypothesis *m1* and *m2* are asymptotically distributed as standard Normal variables with mean 0 and variance 1. *m1* significantly different from zero is consistent with assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are valid). *m2* significantly different from zero is not consistent with assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are invalid). Sargan refers to the test statistic for over-identifying restrictions, distributed asymptotically as a χ^2(df). * Denotes significance at the 10% level. ** Denotes significance at the 5% level. *** Denotes significance at the 1% level.

Table 6: Estimation results for DPE (equity/total assets and ROA volatility as a proxies for risk).

Dependent variable: Dividends/equity, DPE	**OLS1**	**OLS2**	**OLS3**	**FEM1**	**FEM2**	**FEM3**	**GMM1**	**GMM2**	**GMM3**
DPE(t-1)	0.0018	0.0020	0.0020	-0.0060***	-0.0060***	-0.0060***	0.1306***	0.1171***	0.1411***
	(0.0018)	(0.0018)	(0.0018)	(0.0012)	(0.0012)	(0.0012)	(0.0169)	(0.0172)	(0.0166)
CR	-0.2978***	-0.2919***	-0.3036***	-0.4223***	-0.4267***	-0.4267***	-0.4467***	-0.4974***	-0.4205***
	(0.0256)	(0.0255)	(0.0255)	(0.0389)	(0.0387)	(0.0387)	(0.0870)	(0.0893)	(0.0856)
CR(t-1)							0.0926*	0.1765***	0.1893***
							(0.0497)	(0.0482)	(0.0478)
SDROA	0.2294***	0.2408***	0.2445***	0.2733***	0.2759***	0.2759***	-0.0167	0.0116	-0.0619*
	(0.0756)	(0.0756)	(0.0753)	(0.0856)	(0.0856)	(0.0856)	(0.0376)	(0.0386)	(0.0321)
SDROA							0.6891***	0.8431***	0.6042***
(t-1)							(0.1499)	(0.1694)	(0.1549)
ROA	2.4404***	2.4438***	2.4202***	1.7288***	1.7323***	1.7323***	1.2061***	1.2772***	1.1940***
	(0.1141)	(0.1144)	(0.1139)	(0.1479)	(0.1479)	(0.1479)	(0.2000)	(0.2017)	(0.2231)
Loans	-0.0324***	-0.0324***	-0.0334***	-0.0052	-0.0051	-0.0051	-0.0090**	-0.0097**	-0.0122***
Growth	(0.0046)	(0.0046)	(0.0046)	(0.0037)	(0.0037)	(0.0037)	(0.0042)	(0.0044)	(0.0045)
RETE	-0.0022	-0.0021	0.0001	-0.0219***	-0.0222***	-0.0222***	-0.0204	-0.0208	-0.0123
	(0.0026)	(0.0026)	(0.0026)	(0.0055)	(0.0055)	(0.0055)	(0.0137)	(0.0140)	(0.0145)
Size	0.0013***	0.0015***	0.0008*	-0.0158***	-0.0158***	-0.0158***	-0.0058**	-0.0009	-0.0061*
	(0.0004)	(0.0005)	(0.0005)	(0.0029)	(0.0029)	(0.0029)	(0.0027)	(0.0025)	(0.0034)
IPO	-0.0211	-0.0238	-0.0212	-0.0050	-0.0050	-0.0050	-0.0269**	-0.0272**	-0.0276**
	(0.0203)	(0.0203)	(0.0202)	(0.0143)	(0.0143)	(0.0143)	(0.0136)	(0.0138)	(0.0139)
Listing	-0.0052***			-0.0106			-0.0176**		
	(0.0015)			(0.0087)			(0.0087)		
Recorded		-0.0000						0.0004	
Sh.ders		(0.0000)						(0.0003)	
IND1			0.0020						-0.0158
			(0.0018)						(0.0124)
IND3			0.0108***						-0.0054
			(0.0020)						(0.0348)
U.S.	0.0007	-0.0000	0.0009				-0.0386*	-0.0546***	-0.0256
	(0.0021)	(0.0021)	(0.0021)				(0.0221)	(0.0196)	(0.0325)
Year	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Obs	2,969	2,969	2,969	2,969	2,969	2,969	2,313	2,313	2,313
Banks	746	746	746	746	746	746	670	670	670
m1							-4.341***	-4.405***	-4.386***
m2							0.145	0.196	0.238
Sargan							62.15	61.21	57.72
Sargan df							50	49	48

Notes:

Standard errors are reported in parentheses. OLS1-OLS3 are Ordinary Least Square regressions. FEM1-FEM3 are fixed-effects panel-data regressions. GMM1-GMM3, are systems of first-differenced and levels equations. DPE(t-1), CR(t-1) and SDROA(t-1), denote the first lag of DPE, Capital Ratio and SDROA (ROA volatility), respectively. For the GMM specifications, the instruments used are: For DPE: Differenced equations: DPE(t-2),…,DPE(1). Levels equations: ΔDPE(t-1). For CR: Differenced equations: CR(t-3). Levels equations: ΔCR(t-2). For SDROA: Differenced equations: SDROA(t-3). Levels equations: ΔSDROA(t-2). *m1* and *m2* are tests for absence of 1st and 2nd order autocorrelation in the first-differenced residuals, respectively. Under the null hypothesis *m1* and *m2* are asymptotically distributed as standard Normal variables with mean 0 and variance 1. *m1* significantly different from zero is consistent with assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are valid). *m2* significantly different from zero is not consistent with assumption of no serial correlation across disturbances (the assumptions of the GMM-SYS model are invalid). Sargan refers to the test statistic for over-identifying restrictions, distributed asymptotically as a χ^2(df). * Denotes significance at the 10% level. ** Denotes significance at the 5% level. *** Denotes significance at the 1% level.