Bank liquidity and the board of directors

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Abstract
This short paper presents the first attempt to examine empirically the relationship between the level of bank liquidity and the structure of the board of directors, in terms of board size and independence. A novel database on these board characteristics is built that includes banks operating in 10 OECD countries during the period 2000-2006. We find a negative relationship between board size and liquidity, while the impact of board independence is U-shaped. Therefore, we contend that considerations linked to these effects can have interesting implications for the design of bank conduct and for the quality of bank portfolios.

Keywords: Banks; Board size and independence; Liquidity risk
JEL classification: G21; G32

1. Introduction

The recent financial crisis has renewed the interest on bank liquidity risk and its associated costs. In a state of anxiety and turmoil in banking markets customer deposits can be withdrawn at any time, resulting in bank runs that can lead to costly liquidation of assets of even healthy banks. In the present study, we examine whether certain characteristics of the board of directors play a role in determining the level of bank liquidity. In particular, this paper explores empirically the relationship between, on the one hand, the share of a bank's liquid asset holdings and, on the other hand, the size and the composition of the board of directors. Effectively, this analysis brings together the literature on the corporate governance of banks (e.g. Francis et al., 2009; Berger et al., 2005) and the literature on bank liquidity (e.g. Berger et al., 2009; Wagner, 2007).

Banks hold liquid assets for two main reasons. First, to satisfy the demand for new loans without having to recall existing loans or realize term investments such as bond holdings and, second, to meet both daily and seasonal swings in deposits so that withdrawals can be met in a timely and orderly fashion. Intuitively, this discussion relates to liquidity risk, which is known to be one of the most important types of bank risk and its proper management has an important role for the health and growth of banks in both good and bad times. In general, liquidity must be judged in light of a bank's ultimate ability to fund its obligations. Factors that must be examined include, but are not limited to, the volatility of deposits, the degree of reliance on interest-sensitive funds, accessibility to the money market, compliance with internal liquidity policy and the nature, volume and anticipated usage of credit commitments. In short, bank managers have to determine the ideal or optimal level of liquidity so that the

obligations are met without hurting future profits. In other words, a risk-return tradeoff exists, since the more liquid the asset, the less it will earn.

Recent evidence on non-financial firms confirms that corporate governance influences firms' mix of cash and lines of credit and suggests that the choice of corporate liquidity is a channel through which governance works (see e.g. Yun, 2009). Dittmar and Mahrt-Smith (2007) also find that firms with good corporate governance guard their cash resources better, whereas poor governance results in a quick misspend of excess cash in ways that significantly reduce operating performance. While a number of studies have looked into the impact of corporate governance on bank performance (Choi and Hasan, 2005; Francis et al., 2009; Andres and Vallelado, 2008), we are not aware of studies that focus on the relationship between board structure and the liquidity position of banks.[1] This seems odd, as along with capitalization, bank liquidity is considered as the main indicator of bank balance sheet health. Besides the lack of evidence on the board structure-bank liquidity nexus, this study is further motivated by the principles of the Basel Committee (2008), which position the board of directors in the heart of banks' liquidity risk management. For instance, the second principle mentions that the board of directors is ultimately responsible for the level of liquidity risk of the bank, as well as the way this risk is managed. Furthermore, according to the third principle, the board of directors should review and approve at least annually the strategy, policies and practices in relation to liquidity management.

A comprehensive study of the relationship between bank liquidity and board structure must consider two main identification issues. First, bank-level variables tend to persist and liquidity variables are no exception. Failing to account for this

[1] The study that is probably closer to the present one is the recent work of Francis et al. (2009), which suggests that board characteristics are related to the pricing of loans.

persistence may bias the results in an unknown scale and direction. Second and most important, a recent strand of literature argues that firm corporate governance elements are endogenous in performance and/or risk equations. We try to tackle this potential problem by means of appropriate identification methodology. The findings show that the impact of board size on bank liquidity is negative and fairly robust across a number of specifications and estimation methods. In contrast, the relationship between board independence and bank liquidity is found to be U-shaped, implying that liquidity increases only after a certain value on the ratio of independent directors over total directors is reached.

We keep this paper as short as possible, so as to place the spotlight strictly on the board characteristics-bank liquidity nexus. The rest of the paper is structured along the following lines. Section 2 presents the empirical model and describes the dataset of our study. Section 3 reports and discusses the estimation results. Finally, Section 4 offers some policy implications and concludes the paper.

2. Empirical model and data

The empirical examination of the relationship between liquidity and board structure involves estimation of the following equation:

$$Liquidity_{it} = a_0 + a_1 Boardsize_{it} + a_2 Boardindependence_{it} + a_3 B_{it} + a_4 M_t + u_{it} \qquad (1)$$

where *Liquidity* is a measure of bank liquidity of bank *i* at time *t*, *Boardsize* is the natural logarithm of the number of directors in the board of a bank, *Boardindependence* is the natural logarithm of the ratio of independent non-executive directors to the number of total board directors, and *B* and *M* represent bank-level and macroeconomic control variables, respectively.

To study the relationship between bank liquidity and board size and independence as shown in Eq. (1), we build a new database on these two board characteristics. This is a challenging issue since such data is not widely available (see also Laeven and Levine, 2009). Relevant information is collected by hand from the Spencer Stuart Reports.[2] Spencer Stuart, founded in 1956, is one of the leading executive search consulting firms. It also publishes the "Spencer Stuart Board Index", which contains information on the board of directors of the largest companies within the countries that are being covered. This information is gathered from questionnaires and annual reports. We end up with a sample that consists of 127 banks operating in 10 OECD countries (Austria, Canada, Germany, Italy, Netherlands, South Africa, Spain, Sweden, UK, USA) between 2000 and 2006. Therefore, all banks considered are based in relatively developed and liberalized banking systems, a fact that enhances the comparability of the respective observations. The maximum number of available observations is 536, yet some are missing for certain variables.

As discussed in the introduction, a higher level of liquid assets will enable a bank to withstand a temporary loss of confidence on the part of its depositors, but too high liquidity levels will result in future losses owing to the holding of excess low-yield assets. In this paper, bank liquidity is measured alternatively by (i) the ratio of liquid assets to customer deposits and short-term borrowings of a bank and (ii) the ratio of liquid assets to total deposits & borrowed funds. Both ratios show what proportion of liabilities could be met if they were suddenly requested, yet the first ratio considers only the relevant short-term liabilities and the second all liabilities. Thus, by using both measures we examine whether this maturity issue influences the

[2] Since this is a novel dataset, it is available on request.

results. Higher figures on the liquidity variables indicate higher liquidity. Bank-level data used to construct the liquidity variables were collected from Bankscope.

In all estimated equations we control for numerous bank- and country-level characteristics. At the bank-level we control for bank characteristics that have been traditionally interrelated with liquidity and lending decisions of banks. In particular, we control here for (i) bank capitalization using the ratio of equity to assets (denoted as *Capitalization*), (ii) bank size using the logarithm of total assets (*Size*), and (iii) provisioning decisions using the ratio of loan loss provisions to total loans (*Provisions*). Notably, banks decide on the level of the above variables, in relation to and, to some extent, simultaneously with their liquidity decisions. Therefore, it may be preferable to treat all bank-level controls as endogenous variables. In addition to the bank-level variables we also control for a number of structural and macroeconomic conditions common to all banks. Specifically, we control for the monetary conditions in each country using the annual lending rate (*Interest rate*) and for the level of banking activity using the ratio of bank claims to the private sector to GDP (*Bank activity*). Both these variables were obtained from the Global Market Information Database (GMID).

One particular characteristic of the banking industry is that it is heavily regulated. Therefore, when examining problems related to corporate governance and/or bank liquidity one has to account for the role of banking regulations in balancing the interests of owners, managers and other stakeholders in the society (Alexander, 2006). Here, four types of regulations are considered, namely capital requirements, official supervisory power, market discipline and activity restrictions,

and four corresponding indices are employed to capture these types of regulation.[3] The regulatory indices were constructed using data from the World Bank database on "*Bank Regulation and Supervision*" developed by Barth et al. (2001) and updated by Barth et al. (2006, 2008). This approach has been also followed by Fernandez and Gonzalez (2005), Pasiouras et al. (2009) and Agoraki et al. (2009), among others.

Table 1 presents some descriptive statistics for all the variables used in the present study. Correlations between the explanatory variables are relatively low and, thus, multicollinearity is not an issue (see Table 2).

[Please insert Table 1 around here]

[Please insert Table 2 around here]

3. Estimation method and results

3.1. Identification issues and estimation

Estimation of Eq. (1) is carried out using two panel data methods, namely ordinary least squares (OLS) and the generalized method of moments (GMM) for dynamic panels proposed by Blundell and Bond (1998). OLS is used as the benchmark technique, however it may fail to account for a number of identification issues that may be present in the board structure-bank liquidity relationship. In contrast, GMM (i) accounts for the potential endogeneity of the board structure variables, (ii) explores the possibility that liquidity levels of banks persist and that the

[3] The *capital requirements* index accounts for both initial (e.g. are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? can the initial or subsequent injections of capital be done with assets other than cash or government securities? *etc.*) and overall (e.g. is the minimum required capital asset ratio risk-weighted in line with Basle guidelines) capital stringency. The *official supervisory power index* measures the power of the supervisory agencies and shows the extent to which they can take specific actions against bank management and directors, shareholders, and bank auditors. The *market discipline index* is an indicator of market monitoring and shows the degree to which banks are forced to disclose accurate information to the public and whether there are incentives to enhance market monitoring (e.g. absence of deposit insurance scheme, subordinated debt). The *activity restrictions index* is a proxy for the level of restrictions on banks' activities, determined by considering whether securities, insurance, real estate activities, and ownership of non-financial firms are unrestricted, permitted, restricted, or prohibited.

results are driven by heteroskedasticity and (iii) considers whether other determinants of liquidity (i.e. the controls) are also endogenous variables. Among these issues, the potential endogeneity of the board characteristics deserves special attention.

A relatively recent line of literature on firm corporate governance has been attempting to establish a relationship between board size and composition, on the one hand, and firm characteristics, on the other hand, based upon the costs and benefits of the board's monitoring and advising roles (see e.g. Coles et al., 2008; Linck et al., 2008). The main thrust of this literature is that each firm structures the board in a way that promotes its own future value, which tends to also explain the future size and composition of the board. As a result, a causal relationship between board variables and firm performance when the former are assessed as exogenous should be approached with cautiousness. For our purposes, this theory may imply a potential endogeneity of board characteristics in the liquidity equation, especially if banks structure their boards in a way that future liquidity levels are optimized, which will explain the future size and composition of the board.

The issue of endogeneity is fully solved by the Blundell and Bond (1998) GMM technique. In addition GMM also accounts for the dynamics of bank liquidity and the potential endogeneity of the bank-level control variables. All these are achieved with the help of appropriate instruments. In particular, we employ as instruments the second and third lags of the liquidity and of the other bank-level variables (i.e. board-structure variables, *capitalization*, *size* and *provisions*), as well as the logarithm of the age of board directors (information for this variable is available in Spencer Reports).[4] In addition, the regulation indices may also be endogenous in the liquidity equations, since lower levels of liquidity may trigger increased regulatory

[4] We have verified statistically that the correlation of the logarithm of the age of board directors with the board structure variables is high, while its correlation with the liquidity variables is low.

stringency. Thus, the four regulatory indices are also treated as endogenous variables in the GMM regressions (i.e. much like the bank-level variables they are instrumented symmetrically with the dependent variable). For the GMM method this treatment of the lagged values of independent variables as instruments is validated by the extensive discussion and proofs of theorems in Blundell and Bond (1998) and Bond (2002 pp. 16-18). We have examined the sensitivity of our results by additionally or alternatively using as instruments the average board size and share of independent directors of other banks in the country (for arguments in favour of this instrument see the relevant discussion in Laeven and Levine, 2009). The results remained virtually the same and are available on request. A Sargan test for overidentifying restrictions and relevant AR1 and AR2 tests confirm the validity of the instruments.[5]

3.2. Empirical results

Estimation results are presented in Table 3.[6] In all estimated equations we use country dummies to control for country heterogeneity (for expositional brevity coefficients on these variables are not reported). Our variables for the board of directors have a significant impact on liquidity regardless of the estimation approach. This implies that endogenous effects of board characteristics do not prevail, at least in our study. We further test for the preferred model (OLS vs. GMM) using a Hausman test, the results being somewhat inconclusive: from the four Hausman tests two favor OLS and two GMM. Thus, we report all models. Note, however, that as reflected in

[5] If the AR1 test indicates that negative first-order autocorrelation is present, this does not imply that the estimates are inconsistent. Inconsistency would be implied if second-order autocorrelation was present, but this case is rejected by the test for AR2 errors (see Table 3).

[6] We present regressions with all the control variables. The equivalent specifications including only bank-level controls show somewhat more significant coefficients on the board-structure variables (they show significance at the 1% level). However, this is probably due to omitted-variable bias.

the positive and highly significant coefficient on both the lagged liquidity variables, bank liquidity is highly persistent and this seems to rule in favor of GMM estimation.

[Please insert Table 3 around here]

Board size has a negative and statistically significant impact on liquidity, a result that remains robust across all estimated equations and irrespective of the measure used to proxy liquidity. Therefore, it appears - consistent with Yermack (1996) and Huther (1997) - that as the number of directors increases there are problems associated with coordination, communication, and decision-making. In turn, these problems lead to less efficient control and higher liquidity risk or simply inefficient decision making concerning the strategy, policies and practices in relation to liquidity. We further explored the possibility of a non-linear relationship between board size and liquidity (by adding the squared term of the board size variable), however no such pattern was identified.

The relationship between board independence and liquidity was originally found to be insignificant (see columns I, II, V, VI), yet adding the squared term of *boardindependence* among the explanatory variables reveals an interesting U-shaped link (see columns III, IV, VII, VIII). This is a result that holds both in the OLS and GMM regressions and is robust to the different measurement of liquidity. The first part of this finding supports the stewardship theory, which argues that the board should have a significant proportion of inside directors to ensure more effective and efficient decision making (Donaldson, 1990; Donaldson and Davis, 1991). Bhagat and Black (1999) summarize several arguments put forward in the literature as for why insiders could be more effective than outside (independent) directors. For example, they mention that inside directors are highly knowledgeable about the company's operation; they know the strengths and weaknesses of the firm better than independent

directors; they may be better at strategic planning decisions; and they have human and financial capital committed to their company. In another interesting study, Coles et al. (2008) find a positive relationship between firm value and insider representation in high-R&D firms, and suggest that the ratio of insiders can be related to complexity. However, the upward sloping part of the relationship shows that these arguments are weaker as the number of outside directors increases beyond a certain point. Therefore, an increased share of independent directors seems to be useful to monitor any self-interested actions by managers, an analysis that is consistent with the predictions of the so-called agency theory (see Fama, 1980; Fama and Jensen, 1983).

In fact, the point at which the relationship between board independence and bank liquidity turns positive can be calculated using the absolute value of the ratio [(coefficient on board independence)/ (2*coefficient on the squared term of board independence)]. The resulting values for the regressions presented in columns III, IV, VII and VIII are 3.23, 3.50, 3.72 and 3.48, respectively. Note that in the estimated equations we have used the natural logarithm of *Boardindependence*. In percentage terms, the above values are equal to 25.97, 33.11, 41.20 and 32.38. Markedly, these ratios are below the average value of *Boardindependence* in our sample (60.324) and this signals that most banks are at the region where the relationship between board independence and bank liquidity is positive.

Concerning the effect of the bank-level control variables we note that capitalization is positively related with bank liquidity, implying that higher capitalization yields increased levels of liquid assets in bank portfolios. This result is consistent with the risk-absorption theory of well-capitalized banks (see e.g. Repullo, 2004; Von Thadden, 2004). In contrast, the larger the bank, the less is the proportion of liquid assets it holds, which may be the result of relationship lending and/or market

power of banks in making new loans. In turn, all the macroeconomic variables affect bank liquidity significantly. A higher lending rate is associated with higher liquidity, probably because firms are seeking alternative sources of finance when lending rates are high, thus leaving banks with less customers and higher liquidity levels. In addition, higher bank claims to the private sector are associated with lower liquidity levels, which is intuitive because higher claims imply increased lending and thus lower levels of liquid assets. Finally, booming periods are generally associated with increased levels of liquidity in the economy and banks are no exception, as projects during these periods are funded in an efficient way, borrowers are usually able to repay their loans on time and there are fewer bank runs. This is reflected in the positive coefficient on the economic growth variable.

As discussed above, an important set of control variables concerns the regulatory environment. Therefore, it comes as no surprise that all the regulatory variables exert a significant effect on bank liquidity. Capital requirements have a positive and statistically significant impact on liquidity. This can be explained as follows. First, in light of stricter capital standards, banks may decide to substitute loans with alternative forms of assets (VanHoose, 2007). Such assets, like interbank exposures and government securities, are not only less risky but they are also more liquid. In addition, looking into bank liabilities, an increase in capital standards may decrease deposits (Santos, 2001), mainly because deposits and equity are alternative sources of funds for banks. Hence, banks may be forced to substitute equity for deposits and issue new equity to meet capital adequacy requirements. This would result in a lower proportion of assets being funded by deposits, explaining the positive association between our liquidity indicators and the capital requirements index.

Official supervisory power is negatively associated with liquidity, and this is consistent with past studies reporting a similar impact on various aspects of the banking sector (Barth et al., 2002, 2003, 2004). Our findings are also in line with the idea that regulations aiming to enhance market monitoring have a negative impact on banks' risk (e.g. Agoraki et al., 2009) and a positive one on efficiency (e.g. Pasiouras et al., 2009). Finally, the negative association between bank liquidity and the activity restrictions index reveals that fewer restrictions are associated with higher liquidity. This is consistent with Haubrich and Santos (2005), who mention that mixing banking and commerce can result in liquidity synergies. In a similar context, a shift of bank operations from traditional lending to insurance, real estate and securities services can result in an internal market and a conglomerate with higher liquidity.[7]

4. Policy implications and conclusions

The role of the board of directors in shaping bank behavior has received increased attention from academics, market participants, and regulators. It continues to receive attention not only because theory on the relationship between the characteristics of boards on the one hand and bank risk-taking and performance on the other provides conflicting views, but also because empirical evidence on these relationships is rather inconclusive. More importantly for our purposes, existing studies in banking have neglected the effect that the characteristics of the board may have on the level of bank liquidity. However, the level of bank liquidity and the associated risk are of special importance to the banking firm, since it is largely related with elements such as the volatility of deposits, the degree of reliance on interest-

[7] Note, however, that we do not suggest that activity restrictions on banks should be eased. Some recent empirical studies find that activity restrictions reduce banks' risk-taking appetite and lower the equilibrium risk of failure or the probability of banking crises (see e.g. Delis and Staikouras, 2009 and references therein).

sensitive funds, the availability of assets readily convertible into cash and the accessibility to the money market. As all these elements represent the show-case of banks and are notoriously related to many types of banking crises, we ask here whether some board characteristics are responsible for influencing the level of bank liquidity (i.e. liquidity risk).

In the present study we examined the relationship between certain characteristics of the board of directors and liquidity. We constructed a cross-country sample that includes bank-level data on 127 banks that were operating in 10 OECD countries between 2000 and 2006. Following the majority of the related corporate governance literature, we use as board characteristics two variables pertaining to board size and independence. The findings suggest that the relationship between the size of the board and liquidity is negative and that the relationship between board independence and liquidity is U-shaped. Policy implications are straightforward. Banks with larger boards tend to hold a lower level of liquid assets and this may suggest that these banks invest a larger portion of their portfolios in risky activities. In good times this may increase their profitability; however, in bad times this may contribute to a significant increase in the probability of default, especially if a low-liquidity bank behavior is complemented by low levels of capitalization. As regards board independence it seems that there exists a threshold, above which banks with a higher share of independent directors hold a higher proportion of liquid assets. Certainly, this does not imply that too many independent directors are needed in bank boards, as it is generally accepted that too much liquidity is unwanted for banks especially during good times. However, this shows that banks with more independent directors are more conservative towards liquidity risk.

Important extensions to this short paper involve examining whether the above findings hold between banks of different type or if they additionally characterize the insurance industry, which was also hit from the recent financial turmoil. In addition, a promising extension may involve introducing interactions between board characteristics and regulations; such an analysis may improve our understanding on the bank liquidity-board structure nexus. Finally, if data on other characteristics of bank boards is available, one can examine related hypotheses highlighting complementary effects of board characteristics on bank liquidity. We leave these ideas for future research.

References

Agoraki, M-E. K., Delis, M.D., Pasiouras, F., 2009. Regulations, competition and bank risk-taking in transition countries. Journal of Financial Stability, doi:10.1016/j.jfs.2009.08.002 (in press).

Alexander K., 2006. Corporate governance and banks: The role of regulation in reducing the principal-agent problem. Journal of Banking Regulation 7, 17-40.

Andres P., Vallelado E., 2008. Corporate governance in banking: The role of the board of directors. Journal of Banking and Finance 32, 2570-2580.

Barth, J.R, Caprio, G., Levine, R., 2001. The regulation and supervision of bank around the world: a new database. In: Litan, R.E., Herring, R. (Eds.), Integrating Emerging Market Countries into the Global Financial System, Brookings-Wharton Papers in Financial Services, Brooking Institution Press: Washington.

Barth, J.R., Caprio, G., Levine, R., 2004. Bank regulation and supervision: what works best? Journal of Financial Intermediation 13, 205-248.

Barth, J., Caprio, G., Levine, R., 2006. Rethinking Bank Regulation: Till Angels Govern. Cambridge University Press: New York.

Barth, J.R., Caprio, G., Levine, R., 2008. Bank Regulations Are Changing: For better or Worse? Policy Research Working Paper 4646, June, World Bank.

Barth, J.R., Dopico, L.G., Nolle, D.E., Wilcox, J.A., 2002. Bank Safety and Soundness and the Structure of Bank Supervision: A Cross-Country Analysis. International Review of Finance 3, 163-188.

Barth, J.R, Nolle, D.E, Phumiwasana, T., Yago, G., 2003. A Cross-Country Analysis of the Bank Supervisory Framework and Bank Performance. Financial Markets, Institutions and Instruments 12, 67-120.

Basel Committee on Banking Supervision, 2008. Principles for Sound Liquidity Risk Management and Supervision, Bank for International Settlements, September.

Berger, A.N., Bouwman, C.H.S., 2009. Bank liquidity creation. Review of Financial Studies 22, 3779-3837.

Berger, A.N., Clarke, G.R.G., Cull, R., Klapper, L., Udell, G.F., 2005. Corporate governance and bank performance: A joint analysis of the static, selection, and dynamic effects of domestic, foreign, and state ownership. Journal of Banking and Finance 29, 2179-2221.

Bhagat S., Black B.S., 1999. The uncertain relationship between board composition and firm performance. Business Lawyer 54, 921-963.

Blundell, R. W., Bond, S.R., 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 87, 115-143.

Bond, S., 2002. Dynamic panel data models. A guide to micro data methods and practice. CeMMAP Working Paper, No 09/02.

Choi S., Hasan I., 2005. Ownership, governance, and bank performance: Korean Experience. Financial Markets, Institutions & Instruments 14, 215- 241.

Coles J.L., Daniel N.D., Naveen L., 2008. Boards: Does one size fit all? Journal of Financial Economics 87, 329-356.

Delis, M.D., Staikouras, P., 2009. On-site audits, sanctions, and bank risk-taking: An empirical overture towards a novel regulatory and supervisory philosophy. MPRA Paper 16836, University Library of Munich, Germany.

Dittmar A., Mahrt-Smith J., 2007. Corporate governance and the value of cash holdings. Journal of Financial Economics 83, 599-634.

Donaldson L., 1990. The ethereal hand: Organizational economics and management theory. Academy of Management Review 15, 369-381.

Donaldson L., Davis J.H., 1991. Stewardship theory or agency theory: CEO governance and shareholder returns. Australian Journal of Management 16, 49-64.

Fama E., 1980. Agency problems and the theory of the firm. Journal of Political Economy 88, 288-307.

Fama E., Jensen M., 1983. Separation of ownership and control. Journal of Law and Economics 26, 301-325.

Fernandez, A.I., Gonzalez, F., 2005. How accounting and auditing systems can counteract risk-shifting of safety nets in banking: Some international evidence. Journal of Financial Stability 1, 466-500.

Francis, B., Hasan, I., Koetter, M., Wu, Q., 2009. Do corporate board impact financial contracting? Evidence from bank loans. Mimeo.

Haubrich, J.G., Santos, J.AC., 2005. Banking and commerce: A liquidity approach. Journal of Banking & Finance, 29, 271–29.

Huther J., 1997. An empirical test of the effect of board size on firm efficiency. Economics Letters 54, 259-264.

Laeven, L., Levine, R., 2009. Bank governance, regulation and risk taking. Journal of Financial Economics 93, 259-275.

Linck, J., Netter, J., Yang, T., 2008. The determinants of board structure. Journal of Financial Economics 87, 308-328.

Pasiouras, F., Tanna, S., Zopounidis, C., 2009. The impact of banking regulations on banks' cost and profit efficiency: Cross-country evidence. International Review of Financial Analysis 18, 294-302.

Repullo, R., 2004. Capital requirements, market power, and risk-taking in banking. Journal of Financial Intermediation 13, 156-182.

Santos, J.A.C., 2001. Bank Capital Regulation in Contemporary Banking Theory: A Review of the Literature. Financial Markets, Institutions and Instruments 10 (2), 41-84.

VanHoose, D., 2007. Theories of bank behaviour under capital regulation. Journal of Banking and Finance 31, 3680-3697.

Von Thadden, E., 2004. Bank capital adequacy regulation under the new Basel Accord. Journal of Financial Intermediation 13, 90-95.

Wagner, W., 2007. The liquidity of bank assets and banking stability. Journal of Banking and Finance 31, 121-139.

Yermack D., 1996. Higher market valuation of companies with a small board of directors. Journal of Financial Economics 40, 185-211.

Yun H., 2009. The choice of corporate liquidity and corporate governance. Review of Financial Studies 22, 1447-1475.

Table 1
Descriptive statistics

Variable	Mean	St.dev	Minimum	Maximum
Liquidity (first measure)	27.148	80.209	9.825	128.01
Liquidity (second measure)	18.736	29.173	9.713	45.210
Board size	14.144	4.162	6	29
Board independence	60.324	25.182	5.268	91.256
Capitalization	10.448	11.850	0.680	94.860
Total assets	1.47e+08	2.73e+08	48500	1.57e+09
Provisions	2.328	17.662	-0.515	18.893
Interest rate	5.891	1.928	2.800	11.300
Bank activity	0.938	0.367	0.511	1.739
Economic growth	2.048	1.173	-0.062	5.844
Capital requirements	5.059	1.376	2	8
Official supervisory power	9.567	2.575	6	13
Market discipline	5.367	0.621	4	7
Activity restrictions	2.297	0.634	1	3

Notes: The table presents descriptive statistics of the variables used in the empirical analysis; Liquidity (first measure) = liquid assets/customer deposits & short term funding; Liquidity (second measure) = liquid assets/ total deposits & borrowed funds; Board size = number of directors in the board; Board independence = independent non-executive directors/total number of directors; Capitalization = equity/total assets; Total assets = total bank assets; Provisions = loan loss provisions/total loans; Interest rate: the annual lending rate, Bank activity = bank claims to the private sector/GDP; Capital requirements: capital requirements index; Official supervisory power: official disciplinary power index; Market discipline: market discipline index; Activity restrictions: restrictions on banks activities index. Liquidity, Board independence, Capitalization, Loan loss provisions and Interest rate are expressed in % terms.

Table 2
Correlation matrix

	Board size	Board indep.	Capital.	Size	Provis.	Int. rate	Bank activity	Econ. growth	Capital requir.	Off. sup. power	Market disciple.	Activ. restrict.
Board size	1.000											
Board independence	0.073	1.000										
Capitalization	-0.129	-0.143	1.000									
Size	0.448	0.088	-0.456	1.000								
Provisions	-0.008	-0.127	0.490	-0.152	1.000							
Interest rate	0.078	-0.216	0.200	-0.179	0.017	1.000						
Bank activity	-0.028	0.024	-0.157	0.071	0.002	-0.450	1.000					
Economic growth	0.010	0.120	0.006	0.087	-0.077	0.283	-0.016	1.000				
Capital requirements	-0.160	-0.143	0.101	-0.119	0.014	0.196	0.026	0.496	1.000			
Official supervisory power	-0.033	-0.027	0.030	0.281	-0.061	0.040	-0.487	0.254	0.304	1.000		
Market discipline	0.018	-0.044	0.133	-0.282	-0.039	0.189	0.241	0.091	0.106	-0.204	1.000	
Activity restrictions	0.030	-0.060	0.148	-0.178	-0.021	0.375	-0.831	-0.222	-0.284	0.213	0.037	1.000

Notes: The table reports correlation coefficients between the explanatory variables used in our study. The Board size = number of directors in the board; Board independence = independent non-executive directors/total number of directors; Capitalization = equity/total assets; Total assets = total bank assets; Provisions = loan loss provisions/total loans; Interest rate: the annual lending rate, Bank activity = bank claims to the private sector/GDP; Capital requirements: capital requirements index; Official supervisory power: official disciplinary power index; Market discipline: market discipline index; Activity restrictions: restrictions on banks activities index.

Table 2
Bank liquidity and board characteristics

	liquid assets/customer deposits & short-term funding				liquid assets/ total deposits & borrowed funds			
	I	II	III	IV	V	VI	VII	VIII
Lagged liquidity		0.451***		0.444***				
		(7.603)		(7.422)				
Lagged liquidity						0.602***		0.599***
						(10.828)		(10.759)
Board size	-43.640**	-32.740**	-47.111**	-35.023**	-12.881**	-13.639**	-13.705**	-13.309**
	(-2.370)	(-2.178)	(-2.530)	(-2.296)	(-2.404)	(-2.365)	(-2.526)	(-2.517)
Board independence	4.219	-0.432	-70.667**	-70.386**	1.491	-0.066	-54.707***	-55.057***
	-0.769	(-0.104)	(-2.197)	(-2.168)	-0.972	(-0.030)	(-2.902)	(-2.990)
Board independence squared			10.849**	10.056**			7.356**	7.916**
			(1.974)	(1.961)			(1.999)	(2.093)
Capitalization	169.44***	269.42***	175.41***	264.63***	191.18***	182.75***	211.17***	214.52***
	(3.069)	(6.849)	(3.159)	(6.686)	(4.601)	(4.036)	(5.661)	(5.795)
Size	-4.951	-4.094	-4.117	-2.438	-4.374**	-13.220***	-4.367**	-14.482***
	(-3.219)	(-3.016)	(-3.257)	(-3.390)	(-2.455)	(-5.248)	(-2.446)	(-5.536)
Provisions	0.094	0.062	0.091	0.064	-0.021	-0.037	0.002	-0.045
	(1.610)	(1.150)	(1.550)	(1.153)	(-0.032)	(-0.105)	(0.001)	(-0.139)
Interest rate	4.736**	4.694**	4.876**	4.700**	1.479**	1.179**	1.520***	1.182**
	(2.290)	(2.434)	(2.357)	(2.436)	(2.542)	(2.203)	(2.609)	(2.206)
Bank activity	-27.337**	39.570***	-31.100***	-47.238***	-10.046***	-11.293***	-9.664**	-14.194***
	(-2.486)	(-3.574)	(-2.669)	(-3.812)	(-2.609)	(-2.806)	(-2.543)	(-3.206)
Economic growth	1.031***	1.178***	1.028***	1.338***	0.855***	0.915***	0.867***	1.066***
	(3.423)	(3.022)	(3.422)	(3.292)	(3.291)	(3.818)	(3.311)	(3.949)
Capital requirements	27.107***	24.642***	27.003***	25.453***	13.842***	14.556***	13.807***	14.892***
	(2.806)	(2.720)	(2.724)	(2.810)	(3.015)	(3.622)	(3.002)	(3.725)
Official supervisory power	-6.484**	-6.125***	-6.472***	-6.132***	-3.052**	-3.305**	-2.091*	-3.410**
	(-2.213)	(-2.101)	(-2.193)	(-2.110)	(-1.982)	(-2.097)	(-1.946)	(-2.207)

Market discipline	29.138***	30.005***	28.541***	29.432***	14.025**	16.728**	13.852**	16.567**
	(3.040)	(2.910)	(2.892)	(2.679)	(2.422)	(2.556)	(2.314)	(2.505)
Activity restrictions	-46.223***	-42.624***	-45.858***	-42.510***	-21.778***	-22.156***	-20.344***	-22.040***
	(-2.985)	(-2.727)	(-2.880)	(-2.698)	(-3.229)	(-3.562)	(-3.014)	(-3.517)
Observations	492	380	492	380	484	374	484	374
Wald-test	30.278	578.426	31.677	578.467	29.810	172.710	30.842	175.893
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR1		0.005		0.007		0.010		0.009
AR2		0.112		0.125		0.190		0.182
Sargan test		0.282		0.275		0.305		0.192

Notes: The table reports coefficients with t-statistics in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10% level, respectively. Equations I, III, V and VII are estimated using a panel data random effects model and the rest using the Blundell and Bond (1998) GMM method. Dependent variables: Liquid assets/customer deposits & short term funding (columns I-IV) and liquid assets/ total deposits & borrowed funds (columns V-VIII); Board size = number of directors in the board in logarithmic terms; Board independence = independent non-executive directors/total number of directors; Capitalization = equity/total assets; Size = natural logarithm of total bank assets; Provisions = loan loss provisions/total loans; Interest rate: the annual lending rate; Bank activity = bank claims to the private sector/ GDP; Capital requirements: capital requirements index; Official supervisory power: official disciplinary power index; Market discipline: market discipline index; Activity restrictions: restrictions on banks activities index. P-values are reported for (i) the Wald test (goodness of fit of the equation), (ii) the AR1 and AR2 tests of first and second order autocorrelation (second order autocorrelation should be rejected) and (iii) the Sargan test for overidentfying restrictions.