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Abstract

Purpose - According to previous international studies the impact of external regulation on bank risk is ambiguous. This paper asks the question, "When do regulations matter for bank risk-taking?" by reporting the first empirical investigation of how the relation between bank regulations (capital requirements, official supervisory power, and market discipline) and bank risk-taking is moderated by board monitoring characteristics.

Design/methodology/approach - Using SYS-GMM, the analysis of the interaction between bank-level boards of directors' attributes (board size, board independence, and board gender diversity) and external regulation is based on a sample of 493 banks operating in 54 countries over 2001-2015, accounting for three measures of bank risk-taking.

Findings - Regulations matter for bank risk-taking conditional on board characteristics: board size, board independence and board diversity. With the exception of capital requirements, the market discipline exerted by external private monitoring and greater supervisory power are unable to mitigate the propensity to greater risk taking by banks resulting from larger board size, higher board independence and greater gender diversity of the board.

Originality/value - The bank risk empirical literature is still silent as to the interaction between board governance and regulation for the purpose of examining banks' risk-taking. This paper fills this gap, thus making a significant contribution by extending our knowledge of whether and how board governance moderates the relationship between external regulation and bank risk-taking.

Keywords: Corporate governance; Board of directors; Regulation; Banks; Risk taking

Paper type: Research paper

1. Introduction

The 2007/2008 global financial crisis highlighted severe problems with excessive risk-taking by banks as well as bank regulation and supervision [1], with the weak governance of banks frequently pointed to in the literature as the main culprit of the crisis (Kirkpatrick, 2009; Bruner, 2011; DeYoung et al., 2013). Despite being seemingly compliant with Basel capital standards [2] many banks had, in fact, accumulated excessive amounts of leverage, carrying risks which inflicted incalculable losses. Further, liquidity risk proved to be a key driver of financial contagion during this crisis, with the bank regulation framework revealing itself as insufficient to prevent the emergence of the proverbial 'too-big-to-fail' financial institutions (Fullenkamp and Rochon, 2016). The regulatory response with regard to the governance of banks has been substantial, a central feature of the post-crisis financial reform agenda, at both the national and international level (see, for example, Walker, 2009; and International Monetary Fund, 2014), including innumerable additions and amendments to the Basel Accord (Basel Committee on Banking Supervision, 2015).

Against this backcloth, the corporate governance literature has highlighted how the agency problems of banks [3] are exacerbated by the existence of government guarantees and deposit insurance, which distort bankers' incentives and encourage risk taking (Haan and Vlahu, 2016). This literature has also identified the salient features of the role that both the board of directors' structural characteristics and the external national regulator, can play to ensure 'good governance' [4].

Yet, no prior study has specifically investigated how boards' internal governance characteristics moderate the relation between external bank regulations and individual banks' propensity to risk taking. Knowledge of this moderation (interaction) effect is important since it can have important policy implications as different types of regulations may have different effects on bank risk-taking depending on the structure and characteristics of bank boards.

Hagendorff et al. (2010) is the only banking industry study that has specifically tested the interaction between bank board monitoring characteristics and bank regulation. However, Hagendorff et al. (2010) do so for the purpose of examining how the interaction between bank-level monitoring and regulatory regimes influences the announcement period returns of acquiring banks. The bank risk empirical literature is still silent as to the interaction between board governance characteristics and external regulation for the purpose of examining the resulting attitude to risk taking by banks. This gap makes the motivation for such a study both timely and opportune.

The aim of our study is to fill this important gap and, in so doing, make a significant contribution by extending our knowledge of whether and how board governance (in terms of board size, board independence, and board gender diversity) moderates the relation between external regulation (capital requirements, official supervisory power, and market discipline) and bank risk-taking (here measured by insolvency risk, credit risk and volatility of equity returns).

2. A brief literature review

In addition to its advisory role, as a monitor, the board of directors (board) is meant to supervise managers so as to ensure their decisions are in line with the interests of shareholders. As such, the board is regarded as the key internal governance structure holding responsibility for the implementation of an effective system of risk management (Fama and Jensen, 1983; Srivastav and Hagendorff, 2016). Theoretically, the smaller and the more independent the board is (in terms of board size and representation by directors without close connections to management), the more likely that 'good governance' will be enforced (Mehran et al., 2011; Aebi et al., 2012). Some prior evidence shows board size to have a negative relationship with firm performance (see, e.g., Hermalin and Weisbach, 2003). Small boards are expected to be more effective monitors since they can reduce the cost of directors'

free-rider and coordination problems (Jensen, 1993). Large boards have been found to be less agile and cohesive, more susceptible to communication and coordination costs, and to 'free-riding' director problems (see Jensen, 1993; and Pathan, 2009), all of which point to less efficient monitoring by large boards. Independent directors in boards are believed to be better at exerting their monitoring function as they are less obliged to management and are better at representing the interest of shareholders (Hermalin and Weisbach, 2003). There is also a growing debate about gender and its effect on economic outcomes such as risk preferences (e.g., Croson and Gneezy, 2009). Previous literature suggests that women are less over-confident and more risk averse in financial decision making than men (Jianakoplos and Bernasek, 1998; Barber and Odean, 2001). Thus, in theory, a 'good' board, a small-sized one, more independent in nature and with a higher representation of women, is expected to better monitor bank risk-taking.

Nevertheless, studies placing the spotlight on the specific impact of board monitoring and board attributes on bank risk-taking (Akhigbe and Martin, 2006; Pathan, 2009; Grove et al., 2011; Aebi et al., 2012; Beltratti and Stulz, 2012; Erkens et al., 2012; Berger et al., 2014; Elyasiani and Zhang, 2015; Anginer et al., 2016; Nurlan et al., 2016; Srivastav and Hagendorff, 2016; Tsung-Ming, 2017; Mamatzakis et al., 2017), yield, collectively, mixed evidence and, with few notable exceptions (e.g., Laeven and Levine, 2009), tend to ignore the role of external bank regulations. This omission is striking since the wider literature on either financial or non-financial firms suggests that regulatory policies can play an important role in shaping internal governance and the structure and independence of boards (see, for example, Kole and Lehn, 1999; Booth et al., 2002; Li and Song, 2013). The literature is at best ambiguous as to the impact of regulation on the effectiveness of corporate governance in general, and of boards' monitoring efficacy in particular. If regulation limits managerial discretion and restricts its scope to adversely affect shareholder wealth, regulation would act as a substitute for board monitoring (as theoretically predicted by Shleifer and Vishny, 1997,

and empirically proven by Guo et al., 2015). Alternatively, strict regulation may foster greater and more effective institution-level governance resulting in a synergistic and self-reinforcing relationship.

In addition to board monitoring, banks are intensively externally regulated due to their inherent susceptibility to systemic risks. Hence, the external regulator too plays a monitoring role, also to ensure the soundness of financial institutions by acting on behalf of small depositors who may be unable to monitor banks individually, creating incentives, or legislating so as to restrict or regulate the activities of banks, including setting requirements on regulatory capital (Demsetz and Lehn, 1985). Theoretical studies provide two conflicting views on the relationship between regulations and bank performance. From a bank perspective, less strict regulations and restrictions on banking activities may increase opportunities for bank diversification, the risk-shift incentive, thereby reducing risk-taking. On the other hand, less strict regulations and restrictions may expand bank's range of risk investment activities, thereby increasing banks' propensity to risk taking (González, 2005). From a regulator perspective, Barth et al. (2006) and Barth et al., (2013b) suggest two opposite veiws: the 'public interest view' and the 'private interest view'. The 'public interest view' suggests that regulation promotes bank efficiency and mitigates market failures as government acts in the interest of the public. The 'private interest view' suggests that regulation impedes bank performance as government acts in the special interest of the few rather than the broader public.

The existing empirical literature investigating the impact of bank regulations on risk taking (González, 2005; Barth et al., 2008; Agoraki et al., 2011; Delis and Staikouras, 2011) suggests that the influence of bank regulation varies depending on charter value, competition and deposit insurance schemes. Significantly, although some studies find that stricter regulation is associated with lower bank risk-taking (e.g., Buch and DeLong, 2008; Fonseca

and González, 2010; Agoraki et al., 2011; Klomp and De Haan, 2012), other prominent studies do not. For example, examining Basel Core Principles for effective banking supervision (BCPs), the international study by Demirguc-Kunt and Detragiache (2011) does not find regulation to be robustly associated with 'bank soundness', expressed in terms of both bank risk and systemic risk. Using data for over 3,000 banks from 86 countries, they do not find that better regulation and supervision promote sounder banks.

Nevertheless, by and large, the role of interaction between bank regulation and board monitoring on bank risk-taking has been ignored by the above two strands of literature. The first study attempting to examine the effects of regulations on bank risk-taking while also investigating the impact of corporate governance is that by Laeven and Levine (2009). They find that regulation has various effects on bank risk-taking depending on banks' management and ownership structure. Baysinger and Zardkoohi (1986) had already suggested that regulators can exert a complementary monitoring and disciplinary function leading to outcomes similar to those achieved by board monitoring. Stricter bank regulation, therefore, can promote boards to monitor more effectively. On the other hand, it has also been suggested that more extensive monitoring of bank management by regulators can reduce the incentive for boards to effectively monitor. For example, greater official supervisory power, by limiting managerial discretion and providing fewer opportunities for managers to pursue personal benefits, reduces shareholders' incentive to monitor (Li and Song, 2013).

Yet, as noted in our introduction, no prior study has specifically investigated how boards' internal governance moderates the relation between bank regulations and individual banks' propensity to risk taking. Hagendorff et al. (2010) is the only banking industry study that has specifically tested the interaction between bank board monitoring and bank regulation. However, they did so in order to investigate how the interaction between bank-level monitoring and regulatory regimes influences the announcement period returns of

acquiring banks. The bank risk empirical literature is still silent as to the interaction between board governance and regulation for the purpose of examining the resulting attitude to risk taking by banks, which is the focus of our interest.

3. Empirical methodology and data

3.1 Method and variables

Two econometric issues are likely to be encountered when modelling the relationship in question. The first such issue relates to the potential endogeneity of board structure variables. This concern arises because both boards and bank risk-taking may be concomitantly affected by changes in regulatory and macroeconomic conditions. These influences can give rise to undesirable endogenous correlations and/or feedback effects among variables, stemming from reverse causality or simultaneity biases. Such biases may be further augmented by the possible endogeneity inherent in other variables typically entering bank risk equations such as bank capitalisation (see, e.g., the discussion in Delis and Kouretas, 2011). The second econometric issue concerns the need to account for the underlying dynamics of the relationship in question. This need arises because of the well-known persistence of bank risk and bank risk-taking. Such persistence stems from on-going competition in the banking industry, the long-term nature of some borrowing/lending transactions, and the time required for any effects stemming from shocks in macroeconomic fundamentals to smooth over time. In the presence of such effects, the resulting persistence of the risk series means that a static model would inevitably produce biased estimates. This problem calls for a modelling approach capable of estimating a dynamic model specification, that is, a specification that includes the lagged dependent variable as an additional regressor.

To satisfactorily address all the econometric issues outlined above, the methodology we choose to apply is the system generalised methods-of-moments (SYS-GMM) proposed by Arellano and Bover (1995) and Blundell and Bond (1998); a well-known extension of the

GMM estimation technique developed by Arellano and Bond (1991). Unlike other commonly used panel estimation techniques that are unsuitable in application to the empirical analysis we aim to carry out, SYS-GMM can be regarded as the ideal method of choice given our econometric setting. Indeed, as recently noted by De Vita and Kyaw (2017), the SYS-GMM estimator "*thanks to its variables instrumentation, first-difference transformation and simultaneous combination of moment conditions for both the level and first-difference equations, accounts for the underlying dynamics of the data generation process whilst also dealing with country-specific effects, measurement error and endogeneity bias.*" (ibid, p. 9).

This approach has been extensively used in previous governance studies (see, among others, Wintoki et al., 2012; Adams and Mehran, 2012; and Liang et al., 2013), as it deals with potential endogeneity by using lagged board variables and lagged regulatory variables as weak instruments by assuming that board and regulatory variables in earlier years could not have resulted from bank performance in subsequent years, which is a plausible.

Within this methodological approach, our specific econometric model can be represented as:

$$r_{ijt} = \delta_0 + \delta_1 r_{i,j,t-1} + \delta_2 BOARD_{ijt} + \delta_3 reg_{jt} + \delta_4 BOARD_{ijt} * reg_{jt} + \delta_5 b_{ijt} + \delta_6 c_{jt} + \lambda_t + u_{ijt}$$

where *i* represents individual banks, *j* represents countries, *t* represents years. The dependent variable is individual bank risk-taking, *r.* Independent variables are: board structure, *BOARD;* a set of bank regulatory variables, *reg;* a set of bank-level control variables, *b*; country specific variables, *c*; time effects, λ ; and u is the error term. In estimation we use Windmeijer-corrected standard errors. Standard errors are clustered by country and, where multicollinearity is found to be present, by bank**.**

3.2 Measuring bank risk-taking

We use three alternative measures of bank risk-taking: insolvency risk (*ZSCORE*); credit risk (*NPL*); and volatility of equity return (*SDVOL*). Following Laeven and Levine (2009), Pathan (2009), and others, our first measure of bank risk-taking is *ZSCORE*. *ZSCORE* has been widely used in banking studies and is calculated as: $ZSCORE = (ROA + E/A)/\sigma ROA$, where *ROA* and *E / A* are the rate of return on assets and the ratio of equity to assets, respectively; σROA is the standard deviation of the rate of return on assets and is calculated from present year and the past two years. The value of *ZSCORE* is inversely related to the probability of bank insolvency and thus the higher *ZSCORE* is, the more stability. Our second measure is *NPL,* as a proxy for credit risk, which is the ratio of nonperforming loans over total loans. Finally, following Elyasiani and Zhang (2015), we use volatility of stock returns (*SDVOL*) as a proxy for forward looking risk, a measure based on market rather than accounting data, calculated as the standard deviation of monthly stock returns.

3.3 Measuring board structure

Following recently empirical corporate governance studies in the banking industry (see, among others, Adams and Mehran, 2012; and Anginer et al., 2016), we consider three board structure variables: board size (*BSIZE*), board independence (*BINDEP*), and board gender diversity (*BDIVERS*). Board size (*BSIZE*) is measured by the total number of directors. Following Erkens et al. (2012), board independence (*BINDEP*) is measured by the ratio of independent directors who are part of the board. According to BoardEx data, directors are defined as "independent" if they are non-executive directors (i.e., not full-time employees). We also compare the value of repeat observations of board independence among the different databases we draw from to collect such data (BoardEx, Bloomberg and Thomson Reuter Eikon) and can confirm they use the same definition. Board gender diversity is measured by the number of board members to relativize the percentage of females on the board.

We should clarify that, of course, many individual countries over our sample period have introduced codes of corporate governance (CG) mostly in line with international standards, suggesting recommendations and reforms ranging from better disclosure of information to improved external and internal audits (possibly also impacting board structure variables) so as to ensure that companies are more accountable to all shareholders. Yet, by already controlling for governance/board structure variables, our data already captures whatever influence individual countries' CG codes have had in driving such variables.

3.4 Measuring bank regulation

Following previous studies on bank regulation, governance structure, and risk taking (e.g., Agoraki et al., 2011; Li and Song, 2013; Luo et al., 2016), three key regulatory variables are used: capital requirements (*CAPR*); official supervisory power (*SUPP*); and private monitoring (*PRIM*). Bank regulation measures are at the country level. The index of capital requirements (*CAPR*) represents both initial and overall capital stringency. Initial capital stringency indicates whether certain funds can be counted as initially capitalising a bank and whether they are verified by regulatory or supervisory authorities. Overall capital stringency reflects whether the capital requirements consider risk elements and value losses. The capital requirements index can take value between 0 and 10, with higher values indicating more stringent capital requirements. The index of official supervisory power (*SUPP*) represents the power of the bank supervisors to take certain actions on bank management and ranges between 0 and 16 with higher values indicating more powerful supervisors. The index of private monitoring (*PRIM*) reflects the degree of bank supervision such as requirements for banks to release comprehensive information to the public and takes a value from 0 to 12, with higher values indicating more stringent requirements on information disclosure and private monitoring. This is, therefore, a measure of market discipline (*MARDIS*). More detailed and additional information on the three regulatory variables are provided in Appendix A.

3.5 Control variables

We include several bank and country-specific characteristics as control variables. For the bank-level characteristics, we include the natural logarithm of total assets, used as a proxy for bank size (*SIZE*), and the ratio of equity of assets as a proxy for bank capitalisation (*EOA*). We also include a 'foreign-owned' dummy variable (*OWNERSHIP*) from the database of Claessens and van Horen (2014) where foreign-owned banks are identified as those with 50% or more of their shares owned by foreign investors. We add CEO duality (*CEODUAL*) to our specification, a dummy variable taking the value of one if the roles of CEO and board chair are combined and zero if the CEO does not act as the chairman of the board. For the country-level characteristics, we use 'a rule of law' (*RULEOFLAW*) index and a 'legal origin' (*LEGAL*) dummy variable to capture a country's institutional environment. The rule of law index ranges from approximately -2.5 (weak) to 2.5 (strong) and reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence. The legal origin dummy equals to one if a country is in a civil-law regime, and zero if country is under a common-law. We also use bank concentration *(CONC)* defined as a ratio of the total assets of the three largest commercial banks to the total assets of all commercial banks of a country as a proxy of the financing orientation of the country and reliance on banks. Finally, we include the inflation rate (*INFA*) and the natural logarithm of GDP *(LNGDP)* to control for the country macroeconomic (monetary) environment and the stage of economic development.

3.6 Data

We use three main data sources for boards of directors' attributes of individual banks: Bloomberg, BoardEx and Thomson Reuter Eikon. Bank level accounting data is obtained

from FintechConnect and market data is from Thomson Reuter Eikon. The ownership variable is from Claessens and Van Horen (2014). We obtain data on country-level macroeconomic factors from the World Development Indicators (WDI) database, the regulation and supervision variables from Barth et al. (2013a) and the legal and institutional environment variables from Worldwide Governance Indicators (WGI) and La Porta et al. (1999). Unlike most of the previous studies which focus on bank holding companies (e.g., Pathan, 2009; Li and Song, 2013; Elyasiani and Zhang, 2015), we focus on commercial banks only; a choice that ensures a more homogenous sample in terms, for example, of similar production technology. Moreover, regulatory data are only applicable to commercial banks (Lozano-Vivas and Pasiouras, 2010; Luo et al., 2016).

We constructed our sample by first considering all the commercial banks in the Bloomberg, Boardex and Thomson Reuter Eikon database, and then excluding: (i) repeating bank-year observations among the three databases; (ii) banks for which any of the above board measures and regulatory variables were not available; (iii) bank-year observations for which at least one of the bank-specific control variables was missing; (iv) banks for which other country-specific variables were not available. The (unbalanced) sample includes up to 493 banks (the exact number varies across estimated regressions, depending on the risk-taking measure used) in 54 countries over the 2001-2015 period. Given we aim at identifying a relation across countries, cross-sectional variation is important if one is to understand the differences in regulation. To our knowledge, this is the most comprehensive panel data set that has been used to study the bank risk-taking/board attributes relationship. Table 1 and 2 report summary statistics and the correlation matrix of the variables.

[Tables 1 and 2 here]

4. Empirical results and discussion

4.1 Main results

To test the overall validity of the instruments, we use the Hansen J-test of the over-identifying restrictions. We also report the AR(2) test for no second-order correlation and the Windmeijer (2005) corrected standard errors (clustered by country, or by bank, depending on the presence of multicollinearity). The AR(2) test rejects the presence of second-order autocorrelation and the Hansen test indicates that the model is not over-identified in all estimations. The statistically significant coefficients of the lagged dependent variable suggest that bank risk-taking is highly persistent.

Table 3 shows the estimation results. In terms of the individual, independent effects of the variables included in the model, inflation (*INFA*) appears to exert a statistically insignificant effect on bank risk-taking. This result contrasts with the hypothesised monetary transmission mechanism of the risk-taking channel relating to how changes in monetary policy rates affect either risk perceptions or risk-tolerance (Borio and Zhu, 2008). With the exception of column 2, also GDP *(LNGDP)* is mostly statistically insignificant.

Similarly, most of the regulatory, control and board attribute variables such as capital requirement (*CAPR*), board size, *BSIZE* (with the exception of column 1 and 5), board independence, *BINDPEN* (with the exception of column 7, 8 and 9), bank size, *SIZE* (with the exception of column 1 and 9), supervisory power, *SUPP* (with the exception of column 5), market discipline, *PRIM* (with the exception of column 1), capital (*CAPITAL*), foreign ownership, *OWNERSHIP* (with the exception of column 1), legal (*LEGAL*), board independence, *BINDEP* (with the exception of column 7, 8 and 9), CEO duality (*CEODUAL*), board diversity (*BDIVERS*), rule of law (with the exception of column 2), bank concentration, *CONC* (with the exception of column 2 and 5), do not show any significantly robust impact on bank risk-taking. Of these results, the lack of a robustly significant effect of board independence is perhaps the most unexpected one, though we should draw attention to the fact that board independence is different from well-performing independent directors. For

example, see the busy independent director literature, including Fich and Shivdasani (2006). This might be the reason why board independence does not show strongly supportive evidence from our data [5] with the exception of specifications using a forward looking measure of risk (*SDVOL*). Of interest are also the estimates for board size (*BSIZE*) reported in column 1 and 5, where *BSIZE* appears to increase bank risk-taking.

We should now focus on the more telling effects of the interaction terms reported in Table 3. Board independence significantly increases bank risk-taking when interacting with supervisory power (*BINDPEN_SUPP*) in column 1 and 7, and private monitoring (*BINDPEN_PRIM*) in column 1, while board size significantly increases bank risk-taking when interacting with supervisory power (*BSIZE _SUPP*) in column 5, and private monitoring (*BSIZE_PRIM*) in column 2, though decreasing bank risk-taking when interacting with capital requirements (*BSIZE_CAPR*) in column 2. Finally, board diversity significantly increases bank risk-taking when interacting with supervisory power (*BDIVERS_SUPP*) in column 9, and private monitoring (*BDIVERS_PRIM*) in column 3.

Interestingly, though the independent effect of the market discipline through private monitoring (*PRIM*) is negative on bank risk-taking (*ZSCORE*) in column 1 (the estimated coefficient is 0.5461), when interacting with *BINDEPEN, BSIZE* and *BDIVERS* (see column 1, 2 and 3), the effect turns positive on *ZSCORE* measures of bank risk-taking. The interaction term, *BINDPEN_SUPP*, is also significant in column 1 and 7, again denoting a positive effect thereby increasing bank risk-taking. Supervisory power also interacts positively with board independence (*BINDPEN_SUPP*) in column 1 and 7 (-1.4619** and 0.0111**, respectively), board size (*BSIZE _SUPP*) in column 5 (0.0146*), and board diversity (*BDIVERS_SUPP*) in column 9 (0.0140**).

[Tables 4 and 5 here]

We wish to interrogate the data further by splitting the sample according to large and small boards (Table 4) and according to the degree of independence of the board (Table 5), as these are the board attributes that appear to most significantly moderate the relationship between external regulation and bank risk-taking.

As shown in Table 4, *BINDPEN* increases bank risk-taking under large boards (column 3), and so does supervisory power (column 1 and 3). The results for private monitoring are more ambiguous and dependent on the risk measure used, showing a positive effect on risk taking in column 1 (using *ZSCORE*) and a negative effect (using *SDVOL*) in column 5. On the other hand, capital requirements (*CAPR*) are confirmed to decrease risk taking, using *ZSCORE*, under large boards (column 1).

In Table 5 *PRIM* is consistently insignificant and *CAPR* is only significant in column 6, decreasing bank risk-taking (*SDVOL*) under boards characterised by low independence. *BSIZE* is found to increase bank risk-taking (*NPL*) under low independence of boards (column 4).

Taken collectively, our evidence suggests that larger and more independent boards tend to increase bank risk-taking and that such effect is reinforced when they interact with supervisory power and private monitoring. On the other hand, capital requirements deter risk taking by banks.

4.2 Further analysis and robustness tests

We conduct two robustness checks to investigate whether the results reported in Table 3 might be driven by sample distribution, as only less than half of the countries in our sample have five or more banks, and US banks in our panel constitute a large proportion of the sample (see appendix B). We, therefore, exclude countries with less than 5 banks (Table 6) and US banks (Table 7), and re-estimate the regressions underlying the results presented in

Table 3. For Table 6 and 7, we use time and country OLS fixed effects regressions. Our model includes almost 15 explanatory variables and SYS-GMM generates so many lag instrumental variables leading to multicollinearity between current and lagged variables especially within the smaller sample size of such regressions. This empirical strategy also allow us to check the sensitivity of our results across estimation methods.

The new estimations for the two sub-samples yield consistent results for the effect of *BSIZE* and *BINDEPEN*, both of which are found to be statistically significant in most specifications and across risk taking measures in Table 6 and 7, consistently in the direction of increases in bank risk-taking. Interestingly, the independent effect of *PRIM* on risk taking is negative in both Table 6 (column 4, 5, 6, and 9) and Table 7 (column 1, 2, and 3). Most importantly given our purposes, all the statistically significant interaction terms (*BINDEPEN_SUPP; BINDEPEN_PRIM; BSIZE_SUPP; BSIZE_PRIM; BDIVERS_SUPP; BDIVERS_PRIM*) are also in the direction of higher bank risk-taking, suggesting that the strength of board characteristics overrides any constraining influence on bank risk-taking stemming from external regulation (supervisory power and private monitoring), with the exception of higher capital requirements.

[Tables 6 and 7 here]

Of particular significance across the results reported in Table 6 and 7, is the strongly significant effect of bank size (*SIZE*) across most specifications, always in the direction of an increase in bank risk-taking. We suggest that this pattern in the data may be because large boards are more likely to belong to big banks expected to be 'too big to fail'; a perception of 'invincibility' as it were, which may lead the larger boards of big banks to a greater propensity to risk taking. On average, inflation (*INFA*) tends to reduce bank risk-taking, and so do GDP (*LNGDP*), foreign ownership (*OWNERSHIP*), legal requirements (*LEGAL*), and rule of law (*RULEOFLAW*).

5. Conclusion

The innovative element underlying our study lies in testing empirically how bank board's monitoring characteristics moderate the relationship between external banking regulations and risk taking by banks, an analysis that is absent in prior literature. Using data for 493 banks in 54 countries over the period 2001-2015, we find that with the exception of capital requirements, the market discipline exerted by external private monitoring and greater supervisory power are unable to mitigate the propensity to greater risk taking by banks resulting from larger board size, higher board independence and greater gender diversity of the board. Significant interaction effects in the direction of greater bank risk-taking between such board characteristics and external regulation show that the significantly positive effect of board characteristics on bank risk-taking clearly overrides any mitigating effects of supervisor power and private monitoring.

Our results make a significant contribution to the current policy debate on improving the regulatory framework in the banking sector after the 2007/2008 financial crisis. The findings suggest that ignoring individual banks' board attributes, particularly board size and board independence, may lead to erroneous conclusions about the impact of regulation on bank risk-taking. The main implication is that external regulation should focus on stricter capital requirements to be most effective, and monitor more closely big banks with a large, more independent and gender diverse board in an attempt to control their greater propensity to risk taking. Such findings and associated implications should be of particular value to policy makers charged with the design of more effective bank regulation capable of taking into account micro-level internal governance responses.

Notes

1. For a clear discussion of the definition of supervision as a distinct component of bank regulation, we refer interested readers to Litan and Hawke (2012).

2. Basel capital standards relate to the Basel Core Principles (BCPs) which embody the best practices in supervision and regulation. These principles were issued in 1997 by the Basel Committee on Bank Supervision, comprising representatives from bank supervisory agencies of advanced countries.

3. The agency problem in banks stems from the fact that depositors, being fully protected, have weak incentives to monitor shareholders and constrain them from increasing risk taking (e.g., Demsetz et al., 1997).

4. 'Good governance' is a term that has become a part of the vernacular but despite being widely used and debated in the literature, it still lacks conceptual clarity. In general, the concept embraces aspects related to transparency, accountability and ethical leadership within economic institutions and public sector management. Despite this consensus, 'good governance' remains an extremely elusive objective as there is no single approach to it. In the banking sector, the Basel Committee's revised principles on corporate governance at banks provide a framework for effective corporate governance, which is seen as critical to the proper functioning of the banking sector and the economy as a whole. We take this framework as the most suitable operationalisation of the term 'good governance' within the banking sector. The Committee's revised principles aim to provide a framework "within which banks and supervisors should operate to achieve robust and transparent risk management and decision-making and, in doing so, promote public confidence and uphold the safety and soundness of the banking system." (Basel Committee on Banking Supervision, 2015).

5. It is also important to note that a board operates by voting. Accordingly, we also consider using an indicator variable (of majority) instead of a continuous variable in measuring the presence of independent directors. Following Anginer et al. (2016), we calculate an indicator variable for board independence ranging from 1 to 6, with a higher value indicating a more independent board. Specifically, the variable equals '1' if a board is controlled by insiders, '2' if a board is controlled by a majority of insiders and affiliated outsiders, '3' if the fraction of independent board members lies between 50% and 67%, '4' if the fraction lies between 67% and 75%, '5' if the fraction lies between 75% and 90%, and '6' if the fraction is greater than 90% or the board has no more than one officer and no affiliated outsiders. The results are consistent.

References

Acharya, V.V., Anginer, D. and Warburton, A.J. (2016), "*The end of market discipline? Investor expectations of implicit government guarantees",* Syracuse University Working Paper.

Adams, R.B. and Mehran, H. (2012), "Bank board structure and performance: Evidence for large bank holding companies", *Journal of Financial Intermediation.* Vol. 21 No. 2, pp. 243-267.

Aebi, V., Sabato, G. and Schmid, M. (2012), "Risk management, corporate governance, and bank performance in the financial crisis", *Journal of Banking & Finance.* Vol. 36 No. 12, pp. 3213-3226.

Agoraki, M.-E.K., Delis, M.D. and Pasiouras, F. (2011), "Regulations, competition and bank risk-taking in transition countries", *Journal of Financial Stability.* Vol. 7 No. 1, pp. 38-48.

Akhigbe, A. and Martin, A.D. (2006), "Valuation impact of sarbanes–oxley: Evidence from disclosure and governance within the financial services industry", *Journal of Banking & Finance.* Vol. 30 No. 3, pp. 989-1006.

Anginer, D., Demirguc-Kunt, A., Huizinga, H. and Ma, K. (2016), "Corporate governance and bank capitalization strategies", *Journal of Financial Intermediation.* Vol. 26, pp. 1-27.

Arellano, M. and Bond, S. (1991), "Some tests of specification for panel data: Monte carlo evidence and an application to employment equations", *The Review of Economic Studies.* Vol. 58 No. 194, pp. 277-297.

Arellano, M. and Bover, O. (1995), "Another look at the instrumental variable estimation of error-components models", *Journal of Econometrics.* Vol. 68 No. 1, pp. 29-51.

Barber, B.M. and Odean, T. (2001), "Boys will be boys: Gender, overconfidence, and common stock investment", *The Quarterly Journal of Economics.* Vol. 116 No. 1, pp. 261-292.

Barth, J.R., Caprio, G. and Levine, R. (2006), Rethinking bank regulation. *Cambridge Books*.

Barth, J.R., Caprio, G. and Levine, R. (2008), "Bank regulations are changing: For better or worse", *Comparative Economic Studies.* Vol. 50, pp. 537-563.

Barth, J.R., Caprio, G. and Levine, R. (2013a), "Bank regulation and supervision in 180 countries from 1999 to 2011", *Journal of Financial Economic Policy.* Vol. 5 No. 2, pp. 111-219.

Barth, J.R., Lin, C., Ma, Y., Seade, J. and Song, F.M. (2013b), "Do bank regulation, supervision and monitoring enhance or impede bank efficiency", *Journal of Banking & Finance.* Vol. 37 No. 8, pp. 2879-2892.

Basel Committee on Banking Supervision. (2015), "Guidelines: Corporate governance principles for banks. Bank for International Settlements", Available at http://www.bis.org/bcbs/publ/d328.pdf

Baxter Jr, T.C. (2003), "Governing the financial or bank holding company: How legal infrastructure can facilitate consolidated risk management", *Current Issues in Economics and Finance.* Vol. 9 No. 3, pp. 1-8.

Baysinger, B.D. and Zardkoohi, A. (1986), "Technology, residual claimants, and corporate control", *Journal of Law, Economics, Organization.* Vol. 2 No. 2, pp. 339-349.

Beltratti, A. and Stulz, R.M. (2012), "The credit crisis around the globe: Why did some banks perform better", *Journal of Financial Economics.* Vol. 105 No. 1, pp. 1-17.

Berger, A.N., Kick, T. and Schaeck, K. (2014), "Executive board composition and bank risk taking", *Journal of Corporate Finance.* Vol. 28, pp. 48-65.

Blundell, R. and Bond, S. (1998), "Initial conditions and moment restrictions in dynamic panel data models", *Journal of Econometrics.* Vol. 87 No. 1, pp. 115-143.

Booth, J.R., Cornett, M.M. and Tehranian, H. (2002), "Boards of directors, ownership, and regulation", *Journal of Banking & Finance.* Vol. 26 No. 10, pp. 1973-1996.

Borio, C. and Zhu, H. (2008), "Capital Regulation, Risk-Taking and Monetary Policy: A Missing Link in the Transmission Mechanism", Working Paper, No. 268. Bank for International Settlements.

Bruner, C.M. (2011), "Corporate governance reform in a time of crisis", *Journal of Corporation Law.* Vol. 36 No. 2, 309--341.

Buch, C.M. and DeLong, G. (2008), "Do weak supervisory systems encourage bank risk-taking", *Journal of Financial Stability.* Vol. 4 No. 1, pp. 23-39.

Claessens, S. and Van Horen, N. (2014), "Foreign banks: Trends and impact", *Journal of Monet, Credit and Banking*. Vol. 46 No. 1, pp. 295-326.

Croson, R. and Gneezy, U. (2009), "Gender differences in preferences", *Journal of Economic Literature.* Vol. 47 No. 2, pp. 448-474.

De Vita, G. and Kyaw, K.S. (2017), "Tourism specialization, absorptive capacity, and economic growth", *Journal of Travel Research.* Vol. 56 No. 4, pp. 423-435.

Demirguc-Kunt, A. and Detragiache, E. (2002), "Does deposit insurance increase banking system stability? An empirical investigation", *Journal of Monetary Economics.* Vol. 49 No. 7, pp. 1373-1406.

Demirgüç-Kunt, A. and Detragiache, E. (2011), "Basel core principles and bank soundness: Does compliance matter", *Journal of Financial Stability.* Vol. 7 No. 4, pp. 179-190.

Delis, M.D. and Kouretas, G.P. (2011), "Interest rates and bank risk-taking", *Journal of Banking & Finance.* Vol. 35 No. 4, pp. 840-855.

Delis, M.D. and Staikouras, P.K. (2011) "Supervisory effectiveness and bank risk", *Review of Finance.* Vol. 15 No. 3, pp. 511-543.

Demsetz, H. and Lehn, K. (1985), "The structure of corporate ownership: Causes and consequences", *The Journal of Political Economy.* Vol. 93 No. 6, pp. 1155-1177.

Demsetz, R., Saidenberg, M.R. and Strahan, P.E. (1997), "*Agency problems and risk taking at banks*", Federal Reserve Bank of New York.

DeYoung, R., Peng, E.Y. and Yan, M. (2013), "Executive compensation and business policy choices at us commercial banks". *Journal of Financial and Quantitative Analysis.* Vol. 48 No. 1, pp. 165-196.

Elyasiani, E. and Zhang, L. (2015), "Bank holding company performance, risk, and "busy" board of directors", *Journal of Banking & Finance.* Vol. 60, pp. 239-251.

Erkens, D.H., Hung, M. and Matos, P. (2012), "Corporate governance in the 2007–2008 financial crisis: Evidence from financial institutions worldwide", *Journal of Corporate Finance.* Vol. 18 No. 2, pp. 389-411.

Fama, E.F. and Jensen, M.C. (1983), "Separation of ownership and control", *Journal of Law and Economics.* Vol. 26 No. 2, pp. 301-325.

Fang, Y., Hasan, I. and Marton, K. (2014), "Institutional development and bank stability: Evidence from transition countries", *Journal of Banking & Finance.* Vol. 39, pp. 160-176.

Fich, E.M. and Shivdasani, A. (2006), "Are busy boards effective monitors?", *The Journal of Finance.* Vol. 61 No. 2, pp. 689-724.

Fonseca, A.R. and González, F. (2010), "How bank capital buffers vary across countries: The influence of cost of deposits, market power and bank regulation", *Journal of Banking & Finance.* Vol. 34 No. 4, pp. 892-902.

Fullenkamp, C. and Rochon, C. (2016), "Reconsidering bank capital regulation: A new combination of rules, regulators, and market discipline", *Journal of Economic Policy Reform.* Vol. 20 No. 4, pp. 1-17.

González, F. (2005) "Bank regulation and risk-taking incentives: An international comparison of bank risk", *Journal of Banking & Finance.* Vol. 29 No. 5, pp. 1153-1184.

Grove, H., Patelli, L., Victoravich, L.M. and Xu, P. (2011), "Corporate governance and performance in the wake of the financial crisis: Evidence from US commercial banks", *Corporate Governance: An International Review.* Vol. 19 No. 5, pp. 418-436.

Guo, L., Lach, P. and Mobbs, S. (2015), "Tradeoffs between internal and external governance: Evidence from exogenous regulatory shocks", *Financial Management.* Vol. 44 No. 1, pp. 81-114.

Haan, J. and Vlahu, R. (2016), "Corporate governance of banks: A survey", *Journal of Economic Surveys.* Vol. 30 No. 2, pp. 228-277.

Hagendorff, J., Collins, M. and Keasey, K. (2010), "Board monitoring, regulation, and performance in the banking industry: Evidence from the market for corporate control", *Corporate Governance: An International Review.* Vol. 18 No. 5, pp. 381-395.

Hermalin, B.E. and Weisbach, M.S. (2003), "Boards of directors as an endogenously determined institution: A survey of the economic literature (digest summary)", *FRBNY Economic Policy Review.* Vol. 9 No. 1, pp. 17-26.

International Monetary Fund. (2014), "*Chapter 3: Risk-taking by banks: The role of governance and executive pay, Global Financial Stability Report (GFSR).: Risk-taking, Liquidity, and Shadow Banking: Curbing Excess While Promoting Growth",* Internaitonal Monetary Fund, Washington, DC: IMF.

Jensen, M.C. (1993), "The modern industrial revolution, exit, and the failure of internal control systems", *The Journal of Finance.* Vol. 48 No. 3, pp. 831-880.

Jianakoplos, N.A. and Bernasek, A. (1998), "Are women more risk averse?", *Economic Inquiry.* Vol. 36 No. 4, pp. 620-630.

Kirkpatrick, G. (2009), "The corporate governance lessons from the financial crisis", *OECD Journal: Financial Market Trends.* Vol. 20 No. 1, pp. 61-87.

Klomp, J. and Haan, J.D. (2012), "Banking risk and regulation: Does one size fit all?", *Journal of Banking & Finance.* Vol. 36 No. 12, pp. 3197-3212.

Kole, S.R. and Lehn, K.M. (1999), "Deregulation and the adaptation of governance structure: The case of the U.S. airline industry", *Journal of Financial Economics.* Vol. 52 No. 1, pp. 79-117.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R. (1999), "The quality of government", *Journal of Law, Economics, and Organization.* Vol. 15 No. 1, pp. 222-279.

Laeven, L. and Levine, R. (2009), "Bank governance, regulation and risk taking", *Journal of Financial Economics.* Vol. 93 No. 2, pp. 259-275.

Li, L. and Song, F.M. (2013), "Do bank regulations affect board independence? A cross-country analysis", *Journal of Banking & Finance.* Vol. 37 No. 8, pp. 2714-2732.

Liang, Q., Xu, P. and Jiraporn, P. (2013), "Board characteristics and chinese bank erformance", *Journal of Banking & Finance.* Vol. 37 No. 8, pp. 2953-2968.

Litan, R. and Hawke, J. (2012), "Value-Added Bank Supervision: A Framework for Safely Fostering Economic Growth", American Bankers Association, Washington, D.C.

Lozano-Vivas, A. and Pasiouras, F. (2010), "The impact of non-traditional activities on the estimation of bank efficiency: International evidence", *Journal of Banking & Finance.* Vol. 34 No. 7, pp. 1436-1449.

Luo, Y., Tanna, S. and De Vita, G. (2016), "Financial openness, risk and bank efficiency: Cross-country evidence", *Journal of Financial Stability.* Vol. 24, pp. 132-148.

Mamatzakis, E., Zhang, X. and Wang, C. (2017), " *How the corporate governance mechanisms affect bank risk taking"*, Available at: https://mpra.ub.uni-muenchen.de/id/eprint/78137

Mehran, H., Morrison, A.D. and Shapiro, J.D. (2011), "*Corporate governance and banks: What have we learned from the financial crisis?*", in Dewatripont, M. and Freixas, X. (eds.), The crisis aftermath: New regulatory paradigms. Centre for Economic Policy Research.

Nurlan, O., Monowar, M. and Keun Jung, L. (2016), "Corporate governance, financial crises and bank performance: Lessons from top russian banks", *Corporate Governance: The international journal of business in society.* Vol. 16 No. 5, pp. 798-814.

Pathan, S. (2009), "Strong boards, CEO power and bank risk-taking", *Journal of Banking & Finance.* Vol. 33 No. 7, pp. 1340-1350.

Shleifer, A. and Vishny, R.W. (1997), "A survey of corporate governance", *The Journal of Finance.* Vol. 52 No. 2, pp. 737-783.

Srivastav, A. and Hagendorff, J. (2016), "Corporate governance and bank risk-taking", *Corporate Governance: An International Review.* Vol. 24 No. 3, pp. 334-345.

Tsung-Ming, Y. (2017), "Governance, risk-taking and default risk during the financial crisis: The evidence of Japanese regional banks", *Corporate Governance: The international journal of business in society.* Vol. 17 No. 2, pp. 212-229.

Walker, D. (2009), "*A review of corporate governance in uk banks and other financial industry entities – Final Recommendation",* London.

Wintoki, M.B., Linck, J.S. and Netter, J.M. (2012), "Endogeneity and the dynamics of internal corporate governance", *Journal of Financial Economics.* Vol. 105 No. 3, pp. 581-606.

Appendix A

Variables	Description	Source
Board size (BSIZE)	The number of directors in the board.	Bloomberg; BoardEx; Thomson Reuter Eikon
Board independence (BINDEP)	The percentage of total directors who are independent.	Bloomberg; BoardEx; Thomson Reuter Eikon
Board diversity (BDIVERS)	The percentage of total directors who are women.	Bloomberg; BoardEx; Thomson Reuter Eikon
Capital requirements (CAPR)	Index of capital requirements, composed on the basis of answers to following questions: (1) Is the capital-asset ratio risk weighted in line with the Basel I guidelines? (2) Does the minimum capital-asset ratio vary as a function of an individual bank's credit risk? (3) Does the minimum capital-asset ratio vary as a function of market risk? (4) Before minimum capital adequacy is determined, which of the following are deducted from the book value of capital? Market value of loan losses not realized in accounting books? Unrealized losses in securities portfolios? Or unrealized foreign exchange losses? (5) What fraction of revaluation gains is allowed as part of capital? (6) Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? (7) Can the initial disbursement or subsequent injections of capital be done with assets other than cash or government securities? (8) Can initial disbursement of capital be done with borrowed funds? On a scale of 0–10, larger values of this index indicate more stringent capital regulation.	Barth et al. (2013a)
Supervisory power (SUPP)	Index of official supervisory power, determined by adding 1 if answer is yes or 0 otherwise to each of these questions: (1) Does the supervisory agency have the right to meet with external auditors about banks? (2) Are auditors required to communicate directly to the supervisory agency about elicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authority force a bank to change its internal organizational structure? (5) Are off-balance sheet items disclosed to supervisors? (6) Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? (7) Can the supervisory agency suspend the directors' decision to distribute (a) dividends, (b) bonuses, and (c) management fees? (8) Can the supervisory agency supersede the rights of bank shareholders and declare a bank insolvent? (9) Can the supervisory agency suspend some or all ownership rights? (10) Can the supervisory agency (a) supersede	Barth et al. (2013a)

	shareholder rights, (b) remove and replace management, and (c) remove and replace director? The range of this index 0–16, with larger values indicating greater supervisory power.	
Private monitoring (PRIM/MARDIS)	Index of private monitoring, composed on the basis of: (1) whether bank directors and officials are legally liable for the accuracy of information disclosed to the public; (2) whether banks must publish consolidated accounts; (3) whether banks must be audited by certified international auditors; (4) whether 100 percent of the largest 10 banks are rated by international rating Agencies; (5) whether off-balance sheet items are disclosed to the public; (6) whether banks must disclose their risk management procedures to the public; (7) whether accrued, though unpaid interest/principal, enter the income statement while the loan is still non-performing; (8) whether subordinated debt is allowable as part of capital; and (9) whether there is no explicit deposit insurance system and no insurance was paid the last time a bank failed. On a scale of 0–12, higher values of this index indicate greater regulatory empowerment of the monitoring of banks by private investors.	Barth et al. (2013a)
Insolvency risk (ZSCORE)	Indicator of bank soundness, calculated as the natural logarithm of ZSCORE = (ROA + E/A)/Q(ROA).	Authors' calculation using data from FintechConnect
Credit risk (NPL)	Ratio of non-performing loans over total loans as a proxy for credit risk.	Authors' calculation using data from FintechConnect
Market base risk (SDVOL)	The standard deviation of the weekly bank stock returns in each year.	Authors' calculation using data from Datastream
Capital (CAPITAL)	The ratio total equity as percentage of total assets.	Authors' calculation using data from FintechConnect
Bank size (SIZE)	Natural logarithm of total assets (in US dollars).	Authors' calculation using data from FintechConnect
Ownership (OWNERSHIP)	Dummy variable equal to one if bank is foreign owned (50% or more of their assets).	Claessens and Van Horen (2014)
CEO duality (CEODUAL)	Dummy variable, which takes the value of 1 if the roles of CEO and board Chair are combined and 0 if the CEO does not act as the Chairman of the board.	Bloomberg; Boardex; Thomson Reuter Eikon
Inflation rate (INFA)	Inflation rate (annual percent change of average consumer price index).	World Development Indicators (WDI)
GDP (LNGDP)	Natural logarithm of GDP (constant 2010 US$).	World Development Indicators (WDI)
Legal origin (LEGAL)	Dummy variable equal to one if country is civil law, zero if country is common law.	La Porta et al. (1999)
Rule of law (RULEOFLAW)	Index of rule of law ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance. It reflects perceptions of the extent	Worldwide Governance Indicators (WGI)

	to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	
Concentration (CONC)	Banking sector concentration, calculated as the share of assets attributed to three largest banks from the total commercial banking assets in the country.	World Development Indicators (WDI)

Appendix B.
Sample distribution.

Counties	No. of banks	No. of observation
ARGENTINA	1	4
AUSTRALIA	6	60
AUSTRIA	9	58
BELGIUM	3	26
BRAZIL	4	21
CANADA	9	58
CHILE	4	16
CHINA	16	92
COLOMBIA	4	11
CYPRUS	1	5
CZECH REPUBLIC	1	6
DENMARK	5	42
GEORGIA	1	2
GERMANY	10	70
GREECE	6	52
HONG KONG, CHINA	4	35
HUNGARY	1	6
INDIA	11	56
INDONESIA	7	33
IRELAND	6	39
ISRAEL	3	12
ITALY	17	137
JAMAICA	1	4
JAPAN	84	415
KOREA, REP.	6	23
KUWAIT	3	12
LEBANON	1	4
MALAYSIA	8	36
MEXICO	1	7
MOROCCO	1	5
NETHERLANDS	3	23
NIGERIA	2	9
NORWAY	1	9
OMAN	1	5
PANAMA	1	4
PERU	2	5
PHILIPPINES	4	17
POLAND	9	52
PORTUGAL	5	44
RUSSIA	5	29
SAUDI ARABIA	1	6
SINGAPORE	3	24
SLOVAKIA	1	2
SOUTH AFRICA	6	32
SPAIN	11	85
SWEDEN	4	59
SWITZERLAND	3	21
THAILAND	6	24
TURKEY	16	54
UNITED ARAB EMIRATES	1	5
UNITED KINGDOM	5	50
UNITED STATES	169	829
Total	493	2735

Table 1
Summary statistics.

Variable	Observations	Mean	SD	Var	Min	Max
ZSCORE	2,735	3.9954	1.2292	1.6880	-2.9120	9.8426
NPL	2,277	0.0316	0.0506	0.0026	0.0010	0.6237
SDVOL	3,452	0.0438	0.0276	0.0008	0.0028	0.3590
BSIZE	3,452	2.4927	0.3343	0.1118	1.3863	3.5264
BINDPEN	3,452	0.5295	0.3140	0.0986	0.0000	1.0000
BDIVERS	3,054	0.1176	0.1062	0.0113	0.0000	0.7692
CEODUAL	3,452	0.3946	0.4888	0.2390	0.0000	1.0000
SIZE	3,452	18.8725	7.7036	59.3455	5.9962	28.9681
CAPITAL	3,452	0.0848	0.0383	0.0015	0.0003	0.4377
OWNERHSIP	3,452	0.0423	0.2013	0.0405	0.0000	1.0000
CAPR	3,452	6.7113	1.8397	3.3844	2.0000	10.0000
SUPP	3,452	11.7781	2.0778	4.3174	5.3846	16.0000
PRIM/MARDIS	3,452	9.4109	1.3660	1.8661	6.0000	11.0000
CONC	3,452	48.8467	17.8751	319.5210	20.4800	100.0000
RULEOFLAW	3,452	1.1771	0.7415	0.5498	-1.1815	2.0964
LEGAL	3,452	0.4783	0.4996	0.2496	0.0000	1.0000
LNGDP	3,452	28.7924	1.5607	2.4359	23.3089	30.4403
INFA	3,452	8.1114	10.5606	111.5262	-4.2127	40.7146

Table 2
Correlation matrix.

	ZSCORE	NPL	SDVOL	BSIZE	BINDPEN	BDIVER	CEODUAL
ZSCORE	1.0000						
NPL	-0.3417***	1.0000					
SDVOL	-0.4726***	0.4100***	1.0000				
BSIZE	-0.1213***	0.2005***	0.1058***	1.0000			
BINDPEN	0.0085	-0.1181***	-0.0556***	-0.0515**	1.0000		
BDIVER	-0.0101	0.0772***	-0.0235	0.1934***	0.3326***	1.0000	
CEODUAL	0.0192	-0.0690***	-0.0050	0.0218	-0.0715***	-0.1147***	1.0000
	SIZE	CAPITAL	OWNERHSIP	CAPR	SUPP	MARDIS	CONC
SIZE	1.0000						
CAPITAL	-0.2823***	1.0000					
OWNERHSIP	0.1331***	0.0724***	1.0000				
CAPR	-0.2179***	0.3509***	-0.0773***	1.0000			
SUPP	-0.3466***	0.2813***	-0.1307***	0.3257***	1.0000		
PRIM	-0.5085***	0.3575***	-0.1846***	0.3950***	0.3986***	1.0000	
CONC	0.4817***	-0.4217***	0.1257***	-0.3304***	-0.5010***	-0.6065***	1.0000
	RULEOFLAW	LEGAL	LNGDP	INFA			
RULEOFLAW	1.0000						
LEGAL	-0.3312***	1.0000					
LNGDP	0.3233***	-0.4117***	1.0000				
INFA	0.2865***	-0.5188***	0.4597***	1.0000			

Note: This table reports the pairwise correlation coefficients of key variables. *, **, *** denote the correlation coefficients with the significance level at the 10, 5 and 1%, respectively.

Table 3
Bank risk taking, board of directors and regulations.

Variables	(1) ZSCORE	(2) ZSCORE	(3) ZSCORE	(4) NPL	(5) NPL	(6) NPL	(7) SDVOL	(8) SDVOL	(9) SDVOL
Lag dependent variable	0.5130**	0.4080***	0.7456**	0.9703***	0.8563***	1.0394***	0.4810***	0.6179***	0.4544***
	(0.2599)	(0.1485)	(0.3105)	(0.0912)	(0.1941)	(0.1145)	(0.1623)	(0.1050)	(0.1718)
BSIZE	-3.5845*	-1.1025	1.0578	0.0045	0.0379**	0.0052	-0.0087	0.0065	-0.0117
	(2.1005)	(0.8522)	(2.0934)	(0.0198)	(0.0176)	(0.0099)	(0.0247)	(0.0218)	(0.0256)
BINDPEN	-2.1488	1.6656	-0.5541	0.0361	-0.0266	0.0448	0.0471**	0.0361***	0.0452***
	(2.1521)	(1.0914)	(1.6804)	(0.0347)	(0.0265)	(0.0292)	(0.0202)	(0.0136)	(0.0167)
CAPR	-0.4674	0.1356	0.1490	-0.0019	-0.0035	-0.0018	-0.0004	0.0018	0.0004
	(0.4918)	(0.1458)	(0.2528)	(0.0029)	(0.0076)	(0.0016)	(0.0018)	(0.0048)	(0.0020)
SUPP	0.2214	-0.1175	-0.0586	0.0009	0.0058**	0.0020	-0.0003	-0.0001	-0.0003
	(0.3069)	(0.2342)	(0.1291)	(0.0028)	(0.0028)	(0.0013)	(0.0016)	(0.0024)	(0.0014)
PRIM	0.5461*	-0.1419	0.0376	-0.0055	-0.0055	0.0012	-0.0036	-0.0020	-0.0042
	(0.3196)	(0.3341)	(0.3364)	(0.0067)	(0.0153)	(0.0054)	(0.0078)	(0.0102)	(0.0077)
CEODUAL	-1.3336	-0.0090	-0.3099	0.0017	-0.0069	-0.0009	0.0092	0.0138	0.0042
	(1.8278)	(0.4884)	(0.6163)	(0.0152)	(0.0252)	(0.0065)	(0.0123)	(0.0088)	(0.0097)
SIZE	0.1993**	0.0275	0.0114	0.0000	-0.0011	0.0005	0.0010	0.0003	0.0014*
	(0.0983)	(0.0430)	(0.0520)	(0.0009)	(0.0007)	(0.0011)	(0.0011)	(0.0011)	(0.0009)
CATPIAL	9.9250	-5.0325	-6.7454	-0.0364	-0.2185	-0.2645	-0.0895	-0.0473	-0.0070
	(20.2652)	(7.6913)	(12.0389)	(0.2985)	(0.3290)	(0.2045)	(0.1925)	(0.1542)	(0.1491)
OWNERSHIP	4.9824**	-2.0442	1.5454	-0.0031	-0.0946	-0.0096	0.0302	0.0029	0.0402
	(2.2682)	(1.4210)	(2.0296)	(0.0365)	(0.1071)	(0.0149)	(0.0318)	(0.0340)	(0.0593)
INFA	0.0223	0.0032	0.0182	-0.0000	0.0002	0.0000	-0.0001	-0.0002	-0.0001
	(0.0326)	(0.0054)	(0.0132)	(0.0001)	(0.0007)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
LNGDP	0.7837	-0.6603***	-0.2344	-0.0016	0.0091	0.0001	0.0016	0.0003	0.0050
	(0.6554)	(0.2203)	(0.7182)	(0.0060)	(0.0075)	(0.0040)	(0.0030)	(0.0037)	(0.0040)
LEGAL	-0.9858	0.7653	0.2100	0.0069	-0.0103	0.0097	0.0085	0.0073	0.0064

	(0.7728)	(0.5898)	(0.8007)	(0.0084)	(0.0177)	(0.0100)	(0.0080)	(0.0075)	(0.0108)
RULEOFLAW	-0.2798	0.7408**	0.7580	-0.0028	-0.0172	-0.0058	-0.0039	-0.0027	-0.0010
	(0.6478)	(0.3567)	(0.7948)	(0.0057)	(0.0121)	(0.0055)	(0.0064)	(0.0085)	(0.0046)
CONC	0.0126	-0.0770**	-0.0557	-0.0003	0.0012*	-0.0004	-0.0001	0.0000	0.0002
	(0.0462)	(0.0320)	(0.0769)	(0.0009)	(0.0007)	(0.0005)	(0.0005)	(0.0004)	(0.0004)
BDIVERS			-0.2640			-0.0215			-0.0476
			(3.8792)			(0.0407)			(0.0342)
BINDPEN_CAPR	1.0553			-0.0006			0.0005		
	(1.2329)			(0.0136)			(0.0078)		
BINDPEN_SUPP	-1.4619**			-0.0012			0.0111**		
	(0.5721)			(0.0166)			(0.0045)		
BINDPEN_PRIM	-3.5673*			0.0075			0.0001		
	(2.1246)			(0.0215)			(0.0142)		
BSIZE_CAPR		0.5675*			-0.0161			-0.0034	
		(0.3119)			(0.0151)			(0.0107)	
BSIZE _SUPP		-0.0748			0.0146*			0.0008	
		(0.3739)			(0.0080)			(0.0036)	
BSIZE_PRIM		-1.1467**			0.0362			0.0023	
		(0.5053)			(0.0253)			(0.0110)	
BDIVERS_CAPR			0.0318			-0.0020			0.0023
			(0.4940)			(0.0050)			(0.0082)
BDIVERS_SUPP			0.0287			0.0042			0.0140**
			(1.0956)			(0.0050)			(0.0060)
BDIVERS_PRIM			-1.9744*			0.0045			-0.0105
			(1.0593)			(0.0091)			(0.0126)
Observations	2,107	2,107	1,996	1,641	1,641	1,543	2,808	2,808	2,725
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Banks	460	460	441	377	377	359	456	456	451
No. of instruments	46.0000	46.0000	48.0000	46.0000	46.0000	48.0000	46.0000	46.0000	48.0000

AR(2) p-value	0.3896	0.4075	0.8876	0.4969	0.5729	0.3058	0.6994	0.5412	0.6222
Hansen p-value	0.7942	0.3827	0.2171	0.3123	0.9957	0.5256	0.6211	0.5004	0.8991

Note: For all explanatory variables (except year effects and the inflation rate) lags are used as GMM-style instruments. Year dummies and fist lag of the inflation rate are used as IV-style instruments. The p-value of the Hansen J-statistic is the over-identification test for the validity of the instruments. The AR(2) test is the p-value of the test for second -order autocorrelation in first differences. The collapse option of xtabond2 has been chosen. Windmeijer-corrected standard errors are reported in parentheses. Standard errors are clustered by country. We undertake 'centering' of the interaction term of board independence, board size, board diversity and regulatory variables by subtracting the mean from each observation due to highly collinear interaction terms. We add an additional row for board diversity (see columns 3, 6 and 9) due to the smaller sample used as a result of data constraints (fewer observations for board diversity, see Table 1), though estimations are based on maximum available data.*, **, *** denote statistical significance at the 10, 5 and 1%, respectively.

Table 4
Re-estimations by board size.

	Large Board	Small Board	Large Board	Small Board	Large Board	Small Board
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	ZSCORE	ZSCORE	NPL	NPL	SDVOL	SDVOL
Lag dependent variable	0.3910***	0.5161	1.0904***	0.9049***	0.6891***	0.3873
	(0.1219)	(0.3167)	(0.1607)	(0.1748)	(0.2318)	(0.2591)
BINDPEN	0.9915	-0.3458	0.0268*	0.0034	-0.0278	-0.0091
	(0.7045)	(2.5286)	(0.0150)	(0.0301)	(0.0444)	(0.0335)
BDIVERS	1.7878	1.7021	-0.0338	-0.0054	0.0539	0.0051
	(1.8053)	(5.8895)	(0.0344)	(0.0593)	(0.0941)	(0.0806)
CAPR	0.2875***	0.0495	-0.0009	0.0005	0.0080	0.0005
	(0.0851)	(0.3050)	(0.0025)	(0.0029)	(0.0069)	(0.0047)
SUPP	-0.2966***	-0.0450	0.0021*	0.0034	-0.0010	0.0017
	(0.0857)	(0.2368)	(0.0012)	(0.0039)	(0.0083)	(0.0044)
PRIM	-0.3161*	-0.1946	-0.0044	-0.0015	-0.0107*	0.0038
	(0.1883)	(0.6198)	(0.0037)	(0.0075)	(0.0059)	(0.0119)
CEODUAL	-0.1058	-1.1497	-0.0006	-0.0085	0.0118	0.0031
	(0.3624)	(1.0028)	(0.0054)	(0.0241)	(0.0300)	(0.0210)
SIZE	-0.0726	0.0414	0.0007	-0.0008	-0.0006	0.0023
	(0.0650)	(0.0512)	(0.0010)	(0.0015)	(0.0020)	(0.0027)
CATPIAL	5.4366	-4.2926	-0.0763	-0.2131	-0.6583	0.2199
	(17.4873)	(18.2500)	(0.2081)	(0.4390)	(0.4591)	(0.1717)
OWNERSHIP	-2.0162	-2.3939	-0.0108	0.0073	0.1340	0.0497
	(2.9505)	(3.5663)	(0.0113)	(0.0802)	(0.1174)	(0.1292)
INFA	0.0182	0.0106	-0.0000	-0.0000	0.0010*	-0.0001
	(0.0161)	(0.0174)	(0.0001)	(0.0002)	(0.0005)	(0.0001)
LNGDP	-0.2231	-0.4412	0.0000	-0.0035	-0.0063	0.0036
	(0.2784)	(0.4124)	(0.0028)	(0.0057)	(0.0111)	(0.0032)
LEGAL	0.7895	0.2766	0.0005	0.0014	-0.0187	0.0005
	(0.5021)	(0.8764)	(0.0087)	(0.0155)	(0.0191)	(0.0177)
RULEOFLAW	0.4789**	1.0042	-0.0017	-0.0034	0.0065	0.0030
	(0.2029)	(0.7796)	(0.0038)	(0.0108)	(0.0183)	(0.0177)

CONC	-0.0345	-0.0781	-0.0001	-0.0001	-0.0014	0.0001
	(0.0360)	(0.0722)	(0.0003)	(0.0006)	(0.0016)	(0.0009)
Observations	1,006	1,002	1,203	1,119	1,051	1,330
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of banks	234	309	204	234	244	335
No. of instruments	40.0000	39.0000	40.0000	39.0000	40.0000	39.0000
AR(2) p-value	0.9517	0.3478	0.2048	0.1261	0.1614	0.4454
Hansen p-value	0.9293	0.3338	0.7829	0.6520	0.8476	0.2332

Note: For all explanatory variables (except year effects and the inflation rate) lags are used as GMM-style instruments. Year dummies and fist lag of the inflation rate are used as IV-style instruments. The p-value of the Hansen J-statistic is the over-identification test for the validity of the instruments. The AR(2) test is the p-value of the test for second-order autocorrelation in first differences. The collapse option of xtabond2 has been chosen. Windmeijer-corrected standard errors are reported in parentheses and are clustered by country.*, **, *** denote statistical significance at the 10, 5 and 1%, respectively.

Table 5
Re-estimations by bank board independence.

	High Independence	Low Independence	High Independence	Low Independence	High Independence	Low Independence
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	ZSCORE	ZSCORE	NPL	NPL	SDVOL	SDVOL
Lag dependent variable	0.9725**	0.5096**	0.8596***	0.8901***	0.6581	0.5619**
	(0.4284)	(0.2154)	(0.1196)	(0.2322)	(0.4373)	(0.2582)
BSIZE	-1.4483	-1.9743	0.0266	0.0936**	0.0162	-0.0114
,	(1.5426)	(1.5989)	(0.0269)	(0.0400)	(0.0266)	(0.0252)
BDIVERS	-1.3316	-0.9239	-0.0816	-0.0631	0.1107	-0.0682
	(5.3601)	(3.4157)	(0.0627)	(0.0550)	(0.0694)	(0.0666)
CAPR	-0.0945	-0.0754	0.0006	-0.0004	0.0005	-0.0039*
	(0.2859)	(0.1699)	(0.0027)	(0.0038)	(0.0021)	(0.0023)
SUPP	-0.0599	0.0025	0.0039*	0.0030	0.0049**	0.0041
	(0.1847)	(0.1888)	(0.0021)	(0.0064)	(0.0021)	(0.0025)
PRIM	0.4794	0.5558	0.0053	0.0115	0.0065	0.0111
	(0.5479)	(0.5196)	(0.0074)	(0.0131)	(0.0078)	(0.0076)
CEODUAL	-0.8708	0.3862	-0.0114	0.0176	0.0033	0.0079
	(1.1570)	(0.9809)	(0.0110)	(0.0173)	(0.0217)	(0.0110)
SIZE	0.0538	0.0998	0.0006	-0.0017	-0.0009	0.0012
	(0.0816)	(0.1058)	(0.0007)	(0.0030)	(0.0008)	(0.0014)
CATPIAL	14.7998	-7.8375	0.0690	-0.6517**	0.0756	-0.2214
	(21.5091)	(12.9784)	(0.3485)	(0.3040)	(0.1606)	(0.3336)
OWNERSHIP	3.3962	1.8794	0.0483	-0.1245***	0.2310*	-0.0368
	(4.8606)	(1.4656)	(0.0434)	(0.0449)	(0.1214)	(0.0322)
INFA	-0.0243	-0.0235	-0.0000	0.0010	-0.0001	0.0013*
	(0.0285)	(0.0436)	(0.0004)	(0.0012)	(0.0002)	(0.0008)
LNGDP	-0.0356	0.0338	0.0004	-0.0213**	-0.0082	-0.0013
	(0.7074)	(0.2679)	(0.0109)	(0.0091)	(0.0091)	(0.0046)
LEGAL	0.4791	0.1523	0.0096	0.0191	-0.0023	0.0039
	(0.8342)	(0.4532)	(0.0122)	(0.0180)	(0.0129)	(0.0081)
RULEOFLAW	0.8451	-0.2588	0.0035	-0.0139	0.0174	-0.0163**
	(0.8898)	(0.4159)	(0.0141)	(0.0116)	(0.0135)	(0.0067)
CONC	-0.0007	0.0045	0.0005	0.0002	-0.0006	0.0011

	(0.0516)	(0.0403)	(0.0009)	(0.0009)	(0.0009)	(0.0007)
Observations	1,027	969	796	747	1,404	1,321
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of banks	255	244	208	206	265	262
No. of instruments	38.0000	40.0000	38.0000	40.0000	38.0000	40.0000
AR(2) p-value	0.4009	0.5302	0.2193	0.2376	0.8026	0.7730
Hansen p-value	0.3863	0.5856	0.1226	0.9055	0.1057	0.5804

Note: For all explanatory variables (except year effects and the inflation rate) lags are used as GMM-style instruments. Year dummies and fist lag of the inflation rate are used as IV-style instruments. The p-value of the Hansen J-statistic is the over-identification test for the validity of the instruments. The AR(2) test is the p-value of the test for second-order autocorrelation in first differences. The collapse option of xtabond2 has been chosen. Windmeijer-corrected standard errors are reported in parentheses and are clustered by bank due to multicollinearity. *, **, *** denote statistical significance at the 10, 5 and 1%, respectively.

Table 6
Bank risk taking, board of directors and regulations (excluding less than 5 banks).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable	ZSCORE	ZSCORE	ZSCORE	NPL	NPL	NPL	SDVOL	SDVOL	SDVOL
BSIZE	-0.3590**	-0.4300***	-0.4211***	0.0083	0.0086*	0.0088	0.0060**	0.0062*	0.0058***
	(0.1345)	(0.1118)	(0.1324)	(0.0051)	(0.0042)	(0.0056)	(0.0021)	(0.0030)	(0.0020)
BINDPEN	-0.1380**	-0.1398**	-0.1372**	0.0060***	0.0051***	0.0061***	0.0023**	0.0017*	0.0024*
	(0.0554)	(0.0616)	(0.0551)	(0.0015)	(0.0014)	(0.0015)	(0.0011)	(0.0009)	(0.0011)
CAPR	-0.0103	0.0119	0.0040	0.0015	0.0007	0.0016	0.0020	0.0016	0.0019
	(0.0663)	(0.0514)	(0.0461)	(0.0016)	(0.0018)	(0.0016)	(0.0019)	(0.0021)	(0.0019)
SUPP	0.0155	-0.0990	-0.0725	0.0000	0.0007	-0.0001	-0.0016	-0.0010	-0.0015
	(0.0736)	(0.0644)	(0.0575)	(0.0017)	(0.0019)	(0.0016)	(0.0018)	(0.0021)	(0.0018)
PRIM	-0.0199	-0.0486	-0.0246	-0.0073**	-0.0074*	-0.0071*	-0.0044	-0.0049	-0.0045*
	(0.1041)	(0.0801)	(0.0785)	(0.0034)	(0.0041)	(0.0036)	(0.0025)	(0.0033)	(0.0026)
CEODUAL	-0.2583	0.0737	0.0315	-0.0106*	-0.0104	-0.0121	0.0024	0.0030	0.0030
	(0.4763)	(0.3272)	(0.2996)	(0.0059)	(0.0069)	(0.0074)	(0.0043)	(0.0034)	(0.0043)
SIZE	-0.0146**	-0.0109***	-0.0099**	0.0017***	0.0017***	0.0016***	0.0003**	0.0003***	0.0003***
	(0.0062)	(0.0029)	(0.0036)	(0.0004)	(0.0004)	(0.0004)	(0.0001)	(0.0001)	(0.0001)
CATPIAL	7.0491***	7.1162***	7.2854***	-0.0556	-0.0522	-0.0507	-0.0851***	-0.0855***	-0.0858***
	(1.4713)	(1.5151)	(1.4461)	(0.0609)	(0.0587)	(0.0564)	(0.0249)	(0.0247)	(0.0253)
OWNERSHIP	0.2404	0.2731	0.2973	-0.0215**	-0.0192*	-0.0218*	-0.0087***	-0.0053	-0.0087***
	(0.1839)	(0.2375)	(0.2333)	(0.0103)	(0.0100)	(0.0105)	(0.0030)	(0.0036)	(0.0030)
INFA	0.0164***	0.0185***	0.0186***	-0.0005**	-0.0005***	-0.0005**	-0.0003*	-0.0003*	-0.0003*
	(0.0048)	(0.0047)	(0.0047)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0001)
LNGDP	2.7194*	2.4769	2.4662	-0.2414***	-0.2344***	-0.2402***	-0.0816	-0.0749	-0.0824
	(1.3285)	(1.6314)	(1.4845)	(0.0589)	(0.0647)	(0.0589)	(0.0552)	(0.0599)	(0.0552)
LEGAL	0.7207	2.1033	1.7393	-0.2368***	-0.2337***	-0.2337***	-0.0160	-0.0148	-0.0187
	(1.2080)	(1.4193)	(1.3625)	(0.0461)	(0.0497)	(0.0441)	(0.0672)	(0.0731)	(0.0668)
RULEOFLAW	0.9530	1.6371*	1.5871*	-0.1083***	-0.1127***	-0.1074***	-0.0081	-0.0064	-0.0087
	(0.8478)	(0.7978)	(0.7632)	(0.0232)	(0.0241)	(0.0225)	(0.0296)	(0.0340)	(0.0295)
CONC	-0.0005	0.0016	0.0004	0.0006	0.0006	0.0006	0.0001	-0.0000	0.0000
	(0.0111)	(0.0119)	(0.0131)	(0.0004)	(0.0004)	(0.0004)	(0.0001)	(0.0001)	(0.0001)
BDIVERS			0.2018			0.0184			-0.0116

			(0.8592)			(0.0244)			(0.0079)
BINDPEN_CAPR	0.0658			-0.0071**			-0.0057		
	(0.1736)			(0.0029)			(0.0037)		
BINDPEN_SUPP	-0.2281**			0.0076			0.0097***		
	(0.1090)			(0.0046)			(0.0034)		
BINDPEN_PRIM	0.0116			0.0001			0.0075*		
	(0.2268)			(0.0040)			(0.0043)		
BSIZE_CAPR		0.0855			-0.0010			0.0007	
		(0.0808)			(0.0017)			(0.0013)	
BSIZE _SUPP		-0.0405			0.0037*			0.0006	
		(0.0675)			(0.0018)			(0.0013)	
BSIZE_PRIM		-0.0255			0.0029			0.0019	
		(0.1130)			(0.0025)			(0.0023)	
BDIVERS_CAPR			0.2018			0.0184			-0.0116
			(0.8592)			(0.0244)			(0.0079)
BDIVERS_SUPP			-0.0119			0.0073**			-0.0057
			(0.1484)			(0.0028)			(0.0037)
BDIVERS_PRIM			-0.1856			0.0076			0.0098**
			(0.1150)			(0.0047)			(0.0035)
Observations	2,201	2,201	2,201	1,772	1,772	1,772	2,917	2,917	2,917
Country/Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of banks	405	405	405	382	382	382	461	461	461
R-squared	0.2984	0.2879	0.2909	0.6732	0.6706	0.6741	0.4412	0.4211	0.4423

Note: Year and country dummy variables are included. Robust standard errors are reported in parentheses and are clustered by country. We undertake 'centering' of the interaction term of board independence, board size, board diversity and regulatory variables by subtracting the mean from each observation due to highly collinear interaction terms.*, *, **, *** denote statistical significance at the 10, 5 and 1%, respectively.

Table 7
Bank risk taking, board of directors and regulations (non-US banks).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent Variable	ZSCORE	ZSCORE	ZSCORE	NPL	NPL	NPL	SDVOL	SDVOL	SDVOL
BSIZE	-0.3220*	-0.1286	-0.3337*	0.0106	0.0070	0.0117	0.0054	0.0002	0.0053
	(0.1708)	(0.1724)	(0.1717)	(0.0069)	(0.0067)	(0.0076)	(0.0033)	(0.0023)	(0.0032)
BINDPEN	-0.0919	-0.0889	-0.0922	0.0057*	0.0051*	0.0060**	0.0018	0.0014	0.0018
	(0.0686)	(0.0730)	(0.0699)	(0.0028)	(0.0027)	(0.0028)	(0.0018)	(0.0016)	(0.0019)
CAPR	0.0069	0.0183	0.0037	0.0027	0.0018	0.0027	0.0030	0.0027	0.0030
	(0.0489)	(0.0495)	(0.0516)	(0.0018)	(0.0019)	(0.0018)	(0.0023)	(0.0022)	(0.0022)
SUPP	-0.0447	-0.0423	-0.0383	-0.0010	-0.0009	-0.0012	-0.0030	-0.0034*	-0.0030
	(0.0546)	(0.0577)	(0.0536)	(0.0016)	(0.0019)	(0.0015)	(0.0019)	(0.0019)	(0.0019)
PRIM	0.1284**	0.1339*	0.1344**	-0.0027	-0.0021	-0.0025	0.0005	0.0008	0.0004
	(0.0474)	(0.0664)	(0.0516)	(0.0028)	(0.0034)	(0.0030)	(0.0015)	(0.0014)	(0.0014)
CEODUAL	0.0215	-0.0656	0.0894	-0.0104	-0.0110	-0.0131	0.0026	0.0043	0.0029
	(0.5100)	(0.4018)	(0.4896)	(0.0098)	(0.0081)	(0.0119)	(0.0044)	(0.0030)	(0.0046)
SIZE	-0.0116	-0.0103	-0.0105	0.0021**	0.0021**	0.0020**	0.0002	0.0002	0.0002
	(0.0070)	(0.0069)	(0.0070)	(0.0008)	(0.0008)	(0.0008)	(0.0001)	(0.0001)	(0.0001)
CATPIAL	10.0117***	9.8970***	9.8134***	-0.0883	-0.0814	-0.0716	-0.0426	-0.0466	-0.0434
	(2.3445)	(2.2275)	(2.2933)	(0.1223)	(0.1244)	(0.1136)	(0.0441)	(0.0426)	(0.0456)
OWNERSHIP	0.2806	0.2547	0.2901	-0.0207**	-0.0193*	-0.0215**	-0.0080**	-0.0063	-0.0079**
	(0.2364)	(0.2440)	(0.2250)	(0.0097)	(0.0098)	(0.0102)	(0.0035)	(0.0038)	(0.0035)
INFA	0.0155	0.0166	0.0159	-0.0006	-0.0006	-0.0006	-0.0006*	-0.0006*	-0.0006*
	(0.0197)	(0.0182)	(0.0192)	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0003)	(0.0003)
LNGDP	2.4044*	2.2874*	2.3431*	-0.2471***	-0.2406***	-0.2444***	-0.0928*	-0.0892*	-0.0934*
	(1.1882)	(1.1701)	(1.2104)	(0.0456)	(0.0484)	(0.0459)	(0.0459)	(0.0463)	(0.0461)
LEGAL	3.1998**	3.4326**	2.9290**	-0.2793***	-0.2747***	-0.2725***	-0.0689	-0.0656	-0.0714
	(1.2251)	(1.2450)	(1.2030)	(0.0383)	(0.0390)	(0.0356)	(0.0572)	(0.0571)	(0.0578)
RULEOFLAW	2.4948***	2.5533***	2.3972***	-0.1323***	-0.1361***	-0.1299***	-0.0367	-0.0380	-0.0374
	(0.7092)	(0.7625)	(0.6810)	(0.0226)	(0.0217)	(0.0217)	(0.0245)	(0.0258)	(0.0245)
CONC	(0.0124)	(0.0118)	(0.0125)	(0.0004)	(0.0004)	(0.0004)	(0.0001)	(0.0001)	(0.0001)
	(0.0173)	(0.0271)	(0.0457)	(0.0005)	(0.0006)	(0.0006)	(0.0008)	(0.0009)	(0.0007)
BDIVERS			-1.0629**			0.0335			-0.0078

			(0.4644)			(0.0325)			(0.0119)
BINDPEN_CAPR	-0.0478			-0.0047			-0.0034		
	(0.1473)			(0.0033)			(0.0028)		
BINDPEN_SUPP	-0.0735			0.0042			0.0043**		
	(0.1283)			(0.0048)			(0.0018)		
BINDPEN_PRIM	0.2244			0.0035			-0.0022		
	(0.2334)			(0.0042)			(0.0036)		
BSIZE_CAPR		0.0449			-0.0005			0.0014	
		(0.0565)			(0.0021)			(0.0011)	
BSIZE _SUPP		-0.1077			0.0048**			0.0028**	
		(0.0643)			(0.0017)			(0.0012)	
BSIZE_PRIM		-0.2305*			0.0029			0.0045*	
		(0.1245)			(0.0036)			(0.0024)	
BDIVERS_CAPR			-0.0329			-0.0053			-0.0034
			(0.1456)			(0.0032)			(0.0027)
BDIVERS_SUPP			-0.0779			0.0043			0.0043**
			(0.1248)			(0.0048)			(0.0018)
BDIVERS_PRIM			0.2199			0.0034			-0.0021
			(0.2278)			(0.0041)			(0.0036)
Observations	1,372	1,372	1,372	1,131	1,131	1,131	1,696	1,696	1,696
Country/Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of banks	236	236	236	220	220	220	229	229	229
R-squared	0.3734	0.3764	0.3772	0.6732	0.6741	0.6753	0.4822	0.4836	0.4827

Note: Year and country dummy variables are included. Robust standard errors are reported in parentheses and are clustered by country**.** We undertake 'centering' of the interaction term of board independence, board size, board diversity and regulatory variables by subtracting the mean from each observation due to highly collinear interaction terms.*, *, **, *** denote statistical significance at the 10, 5 and 1%, respectively.