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Motivation of risk-taking behavior of banks in different countries: an international perspective

Abstract

Using international data on bank-level and country-level for 867 banks and 43 countries over the period of 1998-2002, this study empirically investigates key determinants of a bank's risk-taking behavior in the context of international comparison. Previous empirical evidences indicate that bank's risk-taking behavior is mainly related to their charter value, stable shareholder holdings, ownership structure, bank financial characteristics, and macroeconomic conditions, respectively. The empirical result based on system GMM estimation indicates that a decline in charter value increases the inventive for bank risk-taking. The empirical relationship between stable shareholders' ownership and bank risk is negative and nonlinear, implying that increasing stable shareholder ownership could help gratefully decrease the bank's risk-taking. This implicates that as the asset substitution effect dominates increasing, the effect of managerial entrenchment on bank risk is significant.

Keywords: bank risk-taking, stable shareholders, franchise value, system GMM, international study.
JEL Classification: C33, G21, G28, G32.

Introduction

Banks intrinsically have strong incentive to take excessive risks in view of both shareholders' limited liability and the agency problem stemming from the conflict of interests between stockholders and managers. First, the shareholder has an incentive to increase the risk of investment assets at the debtholder's expense once debt has been issued (Jensen and Meckling, 1976). And second, the shareholder risk increases monotonically the investment risk as the leverage ratio increases (Green and Talmor, 1986). To maintain a sound and stable banking environment, some regulatory policies aimed at controlling the risk-taking behavior of banks, such as corporate governance, minimum capital requirements and deposit insurance schemes have been implemented around the world. However, some of these regulatory schemes have provided banks with perverse incentives, leading to outcomes unwished for by the regulators. For example, early fixed-premium deposit insurance systems sometimes provided bank shareholders with an incentive to maximize the value of their put-option subsidy, thus leading banks to increase the amount of risk taken. This 'asset substitution moral hazard' problem is also recognized in the banking literature, where an insurance subsidy is provided to the bank, called the option value of deposit insurance. Since the option value increases with asset risk (Merton, 1977), an equity value maximizing bank shareholder desires excessive risks to exploit this option value (Dothan and Williams, 1980; Kareken and Wallace, 1978; Sharpe, 1978). Second, since the option value increases with the leverage ratio – i.e., decreases as the capital to asset ratio increases – relatively well-capitalized banks will be less inclined to increase asset risk (Furlong and Keeley, 1989; Keeley and Furlong, 1990).

Risk-taking in banking has been long recognized in theoretical and empirical research and, most importantly, in the actual conduct of bank regulators. Nevertheless, few previous empirical studies of bank risk-taking have taken into account bank charter value, ownership structure and regulatory environment, both at the bank-specific and country-level. What research does exist includes examining bank risk taking in Japan (Konishi and Yasuda, 2004) and Spain (Garcia-Marco and Fernández, 2008). Cross-country research on factors affecting risk-taking behavior of banks is still in an early stage. Data problems were previously a hindrance for the cross-country research since few bank-level data were available outside of the main developed countries; however, recently established databases allow for better empirical work. Moreover, previous empirical research works from international evidences closely related to this study have investigated some subsets of these factors, in particular deposit insurance and ownership structure associated with bank charter value but not all factors at once. Demirgüç-Kunt and Detragiache's (2002) cross-country study of deposit insurance and banking crises does not control for regulations designed to limit bank risk-taking or for bank level governance traits. Recently, González (2005) used a panel database of 251 banks in 36 countries to analyze the impact of bank regulation on bank charter value and risk-taking. He found that deposit insurance has a positive influence on bank charter value, mitigating the risk-shifting incentives it creates. This positive influence disappeared when controlling for the possible endogeneity of deposit insurance.

This study will investigate the factors influencing bank risk-taking based on cross-country evidence using new data on bank charter value, ownership structure and macroeconomic conditions. This paper is organized as follows. Section 1 provides a review of related literature focusing on bank charter value, ownership structure and regulatory policy, respectively. Section 2 discusses the theoretical framework inspiring this study and the empirical model used to identify the key determinants of risk-taking in banking. The data collection of the sample is also presented here. Section 4 reports the empirical results on main factors influencing bank's risk-taking by using dynamic panel data model.

1. Determinants of risk-taking in banking

There is a number of previous studies on risk-taking in banking. This paper relates to an enormous empirical literature analyzing the single or cross relationships among bank charter value, ownership structure and bank regulations, such as capital adequate requirement and deposit insurance, as these factors relate to bank's risk-taking behavior are also addressed.

1.1. Charter value. Bank charter value (or franchise value) is defined as the value that would be foregone in the event of a closure. Regulatory restrictions on entry and regulatory restrictions on competition in the banking industry would increase a bank's charter value. Since bank owners have much to lose if the bank becomes insolvent, a bank with high charter value may have an incentive to avoid risky business strategies (Buser et al., 1981; Marcus, 1984; Suarez, 1994; Collins et al., 1994). However, the existing literature on this topic argues that the charter value of banks is negatively associated with bank risk (Demsetz and Lehn, 1985; Keely, 1990; Gorton and Rosen, 1995; Demsetz et al., 1996; Gallowey et al., 1997; Osborne and Lee, 2001; Blasko and Sinkey, 2003), and Park (1997) indicating that higher charter value can result in high risk levels at commercial banks, unless completed by effective regulations.

1.2. Ownership structure. This owner/manager agency problem (or the conflicts between stockholders and managers), however, can be mitigated if managers' interests (objects) are aligned with those of the stockholders. One way in which alignment of interests may occur is through insider (managerial) ownership of the firm's stock. As pointed out by McConnel and Servaes (1990), Saunders et al. (1990), Strock and Travlos (1990), Boyd et al. (1993), Esty (1997) and Cebenoyan et al. (1999), ownership structure may have a more powerful effect on the risk characteristics of banks during the periods of deregulation relative to periods of regulation. In the period of deregulation, stockholder-manager conflicts over the degree of risk-taking should be exacerbated. Thus, bank stockholders, ceteris paribus, have greater incentives and ability to increase risk than when regulations are tight and strictly enforced. Recently, Lee (2002) indicated that some of the risk-taking incentives of stockholder controlled banks (compared to managerially controlled banks) are more pronounced for banks with more assets, lower stock-return volatility, and lower balance-sheet-risk characteristics by testing the US Bank Holding Companies.

1.3. Regulatory policy. *1.3.1 Capital adequacy requirement*. Related literature concerning the effect of the capital adequacy requirement on banks' asset risk has also been investigated. Existing studies on this issue do not reach a consensus between theory and empirics. Kahane (1977), Koehn and Santomero (1980), and Kim and Santomero (1988) argue that uniform capital regulation can increase rather than decrease banks' risk-taking incentives. Since the capital requirements restrict the risk-return frontier of a bank, the forced reduction in leverage may induce the bank to reconfigure the composition of its portfolio of risk assets, thus, leading possibly to an increase in risk-taking behavior. Furlong and Keeley (1987, 1989) Gennotte and Pyle (1991), and Besanko and Kanatas (1996), all argue that the contrary is true. Therefore, the effect of capital adequacy requirements on bank risk is an open empirical question. Meanwhile new light on this issue is to shed by constructing a complete model of risk determination that incorporates the discrepant incentives of three agents.

1.3.2. Deposit insurance. Deposit insurance is viewed by many countries as a way to avoid bank runs and contribute to bank stability. As Demirgüç-Kunt and Detragiache (2002) point out the oldest system of national deposit insurance is the U.S. one, which was established in 1934. In the rest of the world deposit insurance became popular after 1980. However, deposit insurance schemes may encourage excessive risk-taking behavior (Merton, 1977; O'Hara and Shaw, 1990; Bhattacharya and Thakor, 1993; Bhattacharya et al., 1998; Hendrickson and Nichols, 2001; Demirgüç-Kunt and Kane, 2002). In a recent study, Demirgüç-Kunt and Detragiache (2002) provide evidence that an explicit deposit insurance scheme, in the absence of strong banking regulations, tends to increase the probability of banking crises. The adverse impact of deposit insurance on bank stability tends to increase when more extensive coverage is offered to depositors, when the scheme is funded and when it is run by the government rather than the private sector. Barth et al. (2004) also report a positive and robust relationship between deposit insurance generosity and the likelihood of a crisis.

However, empirical evidence also shows that the impact of deposit insurance depends on other factors as well. Kane (2000), Demirgüç-Kunt and Detragiache (2002), Demirgüç-Kunt and Kane (2002), and Laeven (2002) conclude that a sound legal system with proper enforcement of rules reduces the adverse effects of deposit insurance on bank risk-taking. Gonzalez (2005) finds that deposit insurance has a positive influence on bank charter value, mitigating the risk-shifting incentives it creates. Gropp and Vesala (2004) examine the European banking systems and suggest that explicit deposit insurance may serve as a commitment device to limit the safety net and permit monitoring by uninsured subordinated debt holders. They also find that credible limits to the safety net reduce risk-taking of only for smaller banks with low charter values and sizeable subordinated debt shares.

2. The model

2.1. Theoretical framework. Recently, Jeitschko and Jeung (2005) have explicitly modeled three different incentives for agents that shape risk-taking behavior in banking; regulatory bodies, shareholders, and management, all-the-while considering how the respective incentives influence the riskiness of a bank portfolio for four distinct assumptions about the characteristics of risk-return profiles. By combining these factors, they demonstrate that a bank's risk can either decrease or increase with capitalization depending on the relative forces of the three agents in determining asset risk and on various parametric assumptions about risk-return profiles.

It is assumed that the three different incentives are represented by a single objective function $U(\alpha)$ of a bank that is described as a weighted average of the value of bank equity $V(\alpha)$, managerial private benefit $E(B(\alpha))$ and regulatory restraints $OV(\alpha)$. Specifically, the risk determination of the bank can be represented by the following maximization problem.

$$\max_{\alpha} U(\alpha) = \delta \times V(\alpha) + \beta \times E[B(\alpha)] - \gamma \times OV(\alpha), \quad (1)$$

where δ is the relative weight placed on the value of bank equity, β is the relative weight placed on managerial private benefit, and γ is the relative weight placed on regulatory restraints. The regulatory restraints are captured here by the option value of deposit insurance. Since the option value is the expected loss to the deposit insurance fund in case of bankruptcy, it seems reasonable to assume that the regulator imposes regulatory restraints according to the option value. The regulatory restraints are not enjoyed by the bank, and thus expressed as the negative value.

For the following analysis the parameters δ, β and γ are all assumed to be positive. They are functions of various corporate governance mechanisms, such as the managerial ownership share (Morck, Shleifer, and Vishny, 1988), the monitoring from the board of directors (Adams, 2001; Adams and Mehran, 2002), the supervision from large shareholders (Shleifer and Vishny, 1986), the controlling challenges by dispersed shareholders (Fluck, 1999), the managerial labor market (Fama, 1980), the threat of takeover (Jensen and Ruback, 1983; Scharfstein, 1988), and general regulatory policy (Park, 1997). For example, δ is an increasing function of the managerial ownership share, and β is a decreasing function of monitoring and takeover threats. The parameter γ may differ depending on bank capitalization. Banks with less capital are likely to be subject to close supervisory surveillance by the bank regulator because low capital may indicate poor performance or higher default risks.

The parameters δ and γ capture the agency problem of the shareholder associated with the deposit insurance subsidy, and the parameter β captures the agency problem of the manager. These agency problems disappear when the value of weights is given by $\delta = \gamma$ and $\beta = 0$. This is the case when deposit insurance is fairly priced and the manager's incentive is perfectly aligned with those of the shareholders. If I define the socially optimal level of risk as the one that will be obtained when no agency problems exist, then the socially optimal risk is the risk level that maximizes the value of the bank, which is $(D + k)\mu(\alpha)$. Therefore, the socially optimal asset risk is simply the one that gives the highest level of mean return. For example, it is zero if $\mu'(\alpha) < 0$ and one if $\mu'(\alpha) > 0$. Assuming that the second order condition (SOC) for an interior optimum is satisfied, the optimal asset risk of the bank (α*) is implicitly given by the first order condition (FOC):

$$U_{\alpha} = \delta \times V_{\alpha} + \beta \times E(B)_{\alpha} - \gamma \times OV_{\alpha} = 0. \quad (2)$$

The SOC is a complicated function of various parameters, and is not easy to solve explicitly. One may note, however, that the SOC is automatically satisfied if all the SOCs for the individual bank's maximization problems are satisfied.

2.2. Empirical model. Based on the theoretical framework, the empirical model is specified as follows:

$$\begin{aligned} Risk_{i,j,t} &= \alpha_0 + \alpha_1 \times Risk_{i,j,t-1} + \alpha_2 \times (Charter\ Value)_{i,j,t} + \alpha_3 \times (Ownership\ Structure)_{i,j,t} + \\ &+ \alpha_4 \times (Holding)_{i,j,t} + \alpha_5 \times (Holding)^2_{i,j,t} + \alpha_6 \times (Bank\ Characteristics)_{i,j,t} + \\ &+ \alpha_7 \times (Macroeconomic\ Conditions)_{j,t} + \zeta_{i,j,t}, \end{aligned} \quad (3)$$

where the bank risk of bank i, country j, in period t ($Risk_{i,j,t}$) is written as a function of lagged bank risk measure $Risk_{i,j,t-1}$, *Charter Value* ($Charter\ value)_{i,j,t}$, *Ownership Structure* ($Ownership\ structure)_{i,j,t}$, stable shareholder's holdings $(Holding)_{i,j,t}$ and square value of stable shareholder's holdings $(Holding)^2_{i,j,t}$, a vector of bank characters variables referred to bank is $(Bank\ Characteristics)_{i,j,t}$; $(Macroeconomic\ conditions)_{j,t}$ variables that capture the macroeconomic conditions common to all banks; $\xi_{i,j,t}$ is the error term; α_0 stands for a constant. All variables used in equation (3) are listed and defined in Table 1.

Table 1. Variable description and data source

Variable	Description	Data source
Dependent variable		
$\sigma_{ROE\ i,j,t}$	Standard deviation of return on equity (ROE) of a bank in a country per year	Authors' calculations based on Bankscope.
$\sigma_{ROA\ i,j,t}$	Standard deviation of return on assets (ROA) of a bank in a country per year	Authors' calculations based on Bankscope.
Independent variable		
Charter value		
Keeley's Q $_{i,j,t}$	Keeley's Q is calculated as follows: $Keeley's\ Q_{i,j,t} = \frac{\left(\begin{array}{l} The\ market\ value\ of\ common\ equity_{i,j,t} \\ +\ the\ book\ value\ of\ preferred\ shares_{i,j,t} \\ +\ the\ book\ value\ of\ total\ debt_{i,j,t} \end{array}\right)}{The\ book\ value\ of\ total\ assets_{i,j,t}}$	Authors' calculations based on Laeven and Levine (2007) and Bankscope.
Ownership Structure		
Holdings $_{i,j,t}$	Stable shareholder's shares of a bank in a country per year	Authors' calculations based on Bankscope.
Holdings $^2_{i,j,t}$	Square of stable shareholder's shares of a bank in a country per year	Authors' calculations based on Bankscope.
Dummy $_{Bank\ Holding\ Company\ i,j,t}$	Dummy variable that equals 1 for Bank Holding Companies; 0 otherwise.	Authors' calculations based on Bankscope.
Dummy $_{Commercial\ Bank\ i,j,t}$	Dummy variable that equals 1 for commercial banks; 0 otherwise.	Authors' calculations based on Bankscope.
Dummy $_{Cooperative\ Bank\ i,j,t}$	Dummy variable that equals 1 for cooperative banks; 0 otherwise.	Authors' calculations based on Bankscope.
Dummy $_{Investment\ Bank\ i,j,t}$	Dummy variable that equals 1 for investment banks; 0 otherwise.	Authors' calculations based on Bankscope.
Dummy $_{Saving\ Bank\ i,j,t}$	Dummy variable that equals for saving banks; 0 otherwise.	Authors' calculations based on Bankscope.
Bank Characteristics		
Log (*total loans*) $_{i,j,t}$	The logarithm value of total loans of a bank in a country per year	Bankscope
Log (*total earnings*) $_{i,j,t}$	The logarithm value of total earnings of a bank in a country per year	Bankscope
Macroeconomic Conditions		
GDP growth rate $_{j,t}$ (%)	Growth rate of nominal GDP volume in a country per year (at 1998 PPP, in US$)	International Monetary Fund (IMF)
Inflation rate $_{j,t}$ (%)	Year-on-year change of the CPI index in a country per year	International Monetary Fund (IMF)

Source: Author's calculation based on databases of both Bankscope and International Monetary Fund (IMF).

2.3. Bank risk. The dependent variable represents the measure for the level of bank risk. Two variables utilized in equation (3) are the standard deviation of a bank's return on asset (ROA) and return on equity (ROE) for each fiscal year. The independent variables of equation (3) are defined as follows:

2.3.1. Charter Value. **Keeley's *Q*** – A bank's charter value can be measured as Keeley (1990), namely as the sum of the market value of equity plus the book value of liabilities divided by the book value of assets. Tobin's *q*, defined as the ratio of the market value of a firm to the replacement cost of its assets, is an attractive theoretical measure to capture charter value given that charter value is an intangible asset that represents a bank's growth opportunities. Lindenberg and Ross (1981) propose a complex estimator of *q* to measure monopoly rent in non-banking industries. However, Chung and Pruitt (1994) and Perfect and Wiles (1994) find that empirically simpler estimators are highly correlated with the Lindenberg and Ross estimator. Thus, I use a simple estimator of *q*, namely the market-to-book equity ratio, as a proxy for charter value. Keeley (1990) uses a market-to-book asset ratio as a proxy for charter value. Collins et al. (1994) use a market-to-book equity ratio as a proxy for growth opportunities, while Gaver and Gaver (1993 and 1995) use both a market-to-book equity and a market-to-book asset ratio (correlation – 0.47). Because bank's assets include assets-in-place and unbooked assets such as the charter value, the numerator of the market-to-book equity ratio should reflect the capitalized value of the bank charter, and the denominator should not. Thus, the higher the charter value, the higher the market-to-book equity ratio. One difficulty in using the market-to-book equity ratio to proxy for bank charter value is that the numerator may reflect the capitalized value of not only charter value but also other sources of unbooked capital. Kane and Unal (1990) develop a model to estimate two sources of a bank's hidden capital: unbookable off-balance-sheet items and misvaluation of bookable on-balance-sheet items. Applying Kane and Unal's procedure to our sample of banks, we find that unbooked items, such as charter value, contribute more to the market value of equity than does undervaluation of on-balance-sheet items. Therefore, according to Laeven and Levine (2007), Keeley's *Q* in this study is calculated as follows:

$$Keeley's\ Q_{i,j,t} = \frac{\begin{pmatrix} The\ market\ value\ of\ common\ equity_{i,j,t} \\ +\ the\ book\ value\ of\ preferred\ shares_{i,j,t} \\ +\ the\ book\ value\ of\ total\ debt_{i,j,t} \end{pmatrix}}{The\ book\ value\ of\ total\ assets_{i,j,t}} \quad (4)$$

2.3.2. Ownership Structure. Variable *Holdings* is the fraction of the bank's shares owned by stable shareholders. $Holdings^2$ is the square value of *Holdings*. $Dummy_{Bank\ Holding\ Company i,j,t}$ is a dummy variable that equals 1 if the bank is bank holding company and zero otherwise. $Dummy_{Commercial\ Bank i,j,t}$ is a dummy variable that equals 1 if the bank is commercial bank and zero otherwise. $Dummy_{Cooperative\ Bank i,j,t}$ is a dummy variable that equals 1 if the bank is cooperative bank and zero otherwise. $Dummy_{Investment\ Bank i,j,t}$ is a dummy variable that equals 1 if the bank is investment bank and zero otherwise. $Dummy_{Saving\ Bank i,j,t}$ is a dummy variable that equals 1 if the bank is saving bank and zero otherwise.

2.3.3. Bank Characteristics. $Log\ (total\ loans)_{i,j,t}$ is the logarithm of total loans of a bank in a country per year. $Log\ (total\ earnings)_{i,j,t}$ is the logarithm of total earnings of a bank in a country per year.

2.3.4. Macroeconomic Conditions. In order to control for macroeconomic conditions, I include the following variable collected from International Monetary Fund (IMF): $GDP\ growth\ rate_{j,t}$ is the growth rate of nominal GDP volume in a country per year (at 1998 PPP, in US$). $Inflation\ rate_{j,t}$ is the year-on-year change of the CPI index in a country per year.

3. Data and methodology

3.1. Data sources. Bank-level data in this study are collected from Bankscope database of Bureau van Dijk's company (henceforth, Bankscope), containing bank financial statements used in a number of other cross-country studies. Using Bankscope has two main advantages. First, it has information for a very large number of banks, accounting for about 90% of total assets in each country (Claessens et al., 2001). Second, and most important, the financial information at the bank level is presented in a standardized format, after adjusting for differences in accounting and reporting standards. Each country in Bankscope has its own data template, thus allowing for differences in the reporting and accounting conventions.

The data are then converted to a "global format" using a globally standardized template derived from the country-specific templates. The global format also provides standard financial ratios, which can be compared across banks and between countries. Therefore, Bankscope is the most comprehensive database that allows cross-country comparisons (Claessens et al., 2001). The sample composed of unbalanced panel data for empirical analysis is 3,415, including 867 banks across 43 countries over the period of 1998-2002 and shown in Appendix. 43 countries included in the sample are: Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong (China), India, Indonesia, Ireland, Israel, Italy, Japan, Jordan, Kenya, Rep. of Korea, Malaysia, Mexico, the Netherlands, Norway, Pakistan, Peru, Philippines, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, the United Kingdom, the United States, and Venezuela. All data are from consolidated accounts, if available, and otherwise from unconsolidated accounts (to avoid double-counting).

3.2. Unbalanced panel unit root test. To eliminate the problem of spurious regression, all variable used in empirical model have first to investigate the stationarity by utilizing the panel unit root test before using the dynamic panel data model. The Im et al. (2003) test and the Fisher type tests of Maddala and Wu (1999) all allow for individual unit root processes so that the coefficient of first-order autoregressive coefficients may vary across cross-sections. The tests are all characterized by the combining of individual unit root tests to derive a panel-specific result.

However, since the structure of my data is unbalanced panel data, I have to use an alternative approach to the panel unit root tests that are proposed by Maddala and Wu (1999). Maddala and Wu (1999) defined γ_i as the *p*-value from any individual unit root test for cross-section *i*, then under the null of unit root for all *N* cross-sections, the asymptotic result indicated that

$$P(\theta) = -2\sum_{i=1}^{N} ln(\gamma_i) \rightarrow \chi^2(2N), \quad (5)$$

where $x^2(2N)$ denotes a chi-squared distribution with $2N$ degree of freedom.

3.3. Dynamic panel data model. To identify the major determinants of bank's risk-taking behavior with unbalanced panel data, this study used the Generalized Method of Moments (GMM) estimators developed for dynamic panel models by Holtz-Eakin et al. (1990), Arellano and Bond (1991, 1998) and Arellano and Bover (1995). According to Roodman (2007), this study apply this general estimators designed situations with (1) "small T, large N" panels, meaning few time periods and many individuals; (2) a linear functional relationship; (3) a single left-hand-side variable that is dynamic, depending on its own past realizations; (4) independent variables that are not strictly exogenous, meaning correlated with past and possibly current realizations of the error; (5) fixed individual effects; and (6) heteroskedasticity and autocorrelation within individuals, but not across them. Hence, the dynamic model of identifying bank's risk-taking behavior can be written as follows:

$$Risk_{i,j,t} - Risk_{i,j,t\text{-}1} = \alpha Risk_{i,j,t\text{-}1} + \beta' X_{i,j,t} + \eta_i + \varepsilon_{i,t}, \quad (6)$$

where $Risk_{i,j,t}$ is the standard deviation of ROA and ROE, respectively; X represents the set of explanatory variables; lagged bank's risk $Risk_{i,j,t}$, bank's individual characters and macroeconomic condition are included; η_i is an unobserved bank-specific effect and $\varepsilon_{j,t}$ is the error term, and the subscripts i, j and t represent bank, country and time period, respectively. Arellano and Bond (1991) propose to difference equation (6):

$$\left(Risk_{i,j,t} - Risk_{i,j,t\text{-}1}\right) - \left(Risk_{i,j,t\text{-}1} - Risk_{i,j,t\text{-}2}\right) = \\ = \alpha\left(Risk_{i,j,t} - Risk_{i,j,t\text{-}1}\right) + \beta'\left(X_{i,j,t} - X_{i,j,t\text{-}1}\right) + \left(\varepsilon_{i,t} - \varepsilon_{i,t\text{-}1}\right). \quad (7)$$

While differencing eliminates the country-specific effect, it introduces a new bias; by construction the new error term, $\left(\varepsilon_{\text{i,t}} - \varepsilon_{\text{i,t-1}}\right)$ is correlated with the lagged dependent variable, $\left(Risk_{i,j,t\text{-}1} - Risk_{i,j,t\text{-}2}\right)$. Under the assumptions that (a) the error term, $\varepsilon_{i,t}$, is not serially correlated, and (b) the explanatory variables, X, are weakly exogenous (i.e., the explanatory variables are assumed to be uncorrelated with future realizations of the error term), Arellano and Bond propose the following moment conditions:

$$E\left[Risk_{i,j,t\text{-}s} \times \left(\varepsilon_{i,t} - \varepsilon_{i,t\text{-}1}\right)\right] = 0 \text{ for } s \geq 2;\ t = 3,...,T, \quad (8)$$

$$E\left[X_{i,j,t\text{-}s} \times \left(\varepsilon_{i,t} - \varepsilon_{i,t\text{-}1}\right)\right] = 0 \text{ for } s \geq 2;\ t = 3,...,T. \quad (9)$$

3.3.1. Difference GMM. Using these moment conditions, Arellano and Bond (1991) propose a two-step GMM estimator. In the first step the error terms are assumed to be independent and homoskedastic across banks and over time. In the second step, the residuals obtained in the first step are used to construct a consistent estimate of the variance-covariance matrix, thus relaxing the assumptions of independence and homoskedasticity. The two-step estimator is thus asymptotically more efficient relative to the first-step estimator. The GMM estimators are based on the same conditions as the difference estimator. García-Marco and Robles-Fernández (2007) recently used this estimator to analyze the determinants of risk-taking in Spanish financial intermediaries. There are, however, conceptual and statistical shortcomings with this difference estimator. Conceptually, the ability to study the cross-country effect on bank's risk-taking behavior is eliminated in the difference estimator. Statistically, Alonso-Borrego and Arellano (1996) and Blundell and Bond (1998) show that when there are persistent explanatory variables, lags of these variables are weak instruments for a differenced dependent variable in a regression. This influences the asymptotic and small-sample performance of the difference estimator. Asymptotically, the variance of the coefficients rises. In small samples, Monte Carlo experiments show that the weakness of the instruments can produce biased coefficients. Finally, differencing may exacerbate the bias due to measurement errors in variables by decreasing the signal-to-noise ratio (see Griliches and Hausman, 1986).

3.3.2. System GMM. To reduce the potential biases and imprecision associated with the difference estimator, I use an estimator that combines the regression in differences with the regression in levels (Arellano and Bover, 1995; Blundell and Bond, 1998). The instruments for the regression in differences are the same as those described above. The instruments for the regression in levels are the lagged differences of the corresponding variables. These are appropriate instruments under the following additional assumption: although there may be correlation between the levels of the right-hand side variables and the bank-specific effect in equation (3), there is no correlation between the differences of these variables and the bank-specific effect. Given that lagged levels are used as instruments in the regression in differences, only the most recent difference is used as an instrument in the regression in levels. Using additional lagged differences would result in redundant moment conditions (Arellano and Bover, 1995). Thus, additional moment conditions for the second part of the system (the panel data model in levels) are:

$$E\left[\left(Risk_{i,j,t\text{-}s} - Risk_{i,j,t\text{-}s\text{-}1}\right) \times \left(\eta_i + \varepsilon_{i,t\text{-}1}\right)\right] = 0 \text{ for } s = 1, \quad (10)$$

$$E\left[\left(X_{i,j,t\text{-}s} - X_{i,j,t\text{-}s\text{-}1}\right) \times \left(\eta_i + \varepsilon_{i,t\text{-}1}\right)\right] = 0 \text{ for } s = 1. \quad (11)$$

Thus, the moment conditions presented in equations (8)-(11) are used to employ the system panel estimator to generate consistent and efficient parameter estimates. The consistency of the GMM estimator depends on the validity of the assumption that the error terms do not exhibit serial correlation and on the validity of the instruments. To address these issues, I use two specification tests suggested by Arellano and Bond (1991, 1998), Arellano and Bover (1995), and Blundell and Bond (1998). The first is a Sargan (1958) test of over-identifying restrictions which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. The second test examines the hypothesis that the error term $\varepsilon_{i,t}$, is not serially correlated. I test whether the differenced error term is second-order serially correlated (by construction, the differenced error term is probably first-order serially correlated even if the original error term is not). Failure to reject the null hypotheses of both tests gives support to our model.

Both the difference and the system estimator present certain problems when applied to samples with a small number of cross-sectional units. As shown by Arellano and Bond (1991) and Blundell and Bond (1998), the asymptotic standard errors for the two-step estimators are biased downwards. The one-step estimator, however, is asymptotically inefficient relative to the two-step estimator, even in the case of homoskedastic error terms. Thus, while the coefficient estimates of the two-step estimator are asymptotically more efficient, the asymptotic inference from the one-step standard errors might be more reliable. This problem is exacerbated when the number of instruments is equal to or larger than the number of cross-sectional units. This biases both the standard errors and the Sargan test downwards and might result in biased asymptotic inference.

This problem is addressed in three ways. First, considering the first-stage results, while the coefficient estimates are less efficient, the asymptotic standard errors are unbiased. Second, I include a limited number of control variables at a time. Specifically, for the macroeconomic condition's information set, only two additional macroeconomic variables at a time are included, rather than including them all at once, as is usual with cross-country panel data models. This reduces the number of instruments to less than the number of cross-sectional observations. By keeping the instrument set small, I minimize the overfitting problem and maximize the confidence that one has in the more efficient two-step system estimator. Third, I use an alternative specification of the instruments employed in the two-step system estimator. Typically, users of the difference and system estimator treat the moment conditions as applying to a particular time period. This provides for a more flexible variance-covariance structure of the moment conditions (Ahn and Schmidt, 1995) because the variance for a given moment condition is not assumed to be the same across time. This approach has the drawback that the number of over-identifying conditions increases dramatically as the number of time periods increases.

Consequently, this typical two-step estimator tends to induce overfitting and potentially biased standard errors. To limit the number of overidentifying conditions, I follow Calderon, Chong and Loayza (2000) and apply each moment condition to all available periods. This reduces the overfitting bias of the two-step estimator. However, applying this modified estimator reduces the number of periods in our sample by one. While in the standard dynamic panel data estimator time dummies and the constant are used as instruments for the second period, this modified estimator does not allow the use of the first and second period. While losing a period, the Calderon, Chong, and Loayza (2000) specification reduces the overfitting bias and, therefore, permits the use of a heteroskedasticity-consistent system estimator.

4. Empirical results

The empirical findings are shown in two parts: first, we exhibit the descriptive statistics and unbalanced panel unit root test of all variables used in the empirical model; second, we identify the determinants of the bank's risk taking behavior using different econometric estimation.

4.1. Descriptive analysis. Table 2 contains descriptive statistics (mean, median and standard deviation, Maximum, Minimum, Skewness and Kurtosis) for the non-qualitative variables in model (3). In particular, testing the normality using the Jarque-Bera Normality Test, reveals much greater asymmetry except Log (*total loans*) among σ_{ROE}, σ_{ROA}, Keely's *Q*, *Holdings*, *Holdings*^{2}, Log (*total earnings*), *Inflation rate*, and *GDP growth rate*.

Table 2. Descriptive statistics

Statistics	σ_{ROE}	σ_{ROA}	Keeley's *Q*	*Holdings*	*Holdings*^{2}	Log (*total earnings*)	Log (*total loans*)	Inflation rate (%)	GDP growth rate (%)
Mean	0.077	0.101	1.055	2.535	43.036	6.149	6.456	2.402	1.471
Median	0.031	0.009	1.021	0.167	0.028	6.091	6.456	2.188	1.582
Maximum	3.971	0.753	3.339	65.726	4319.910	8.707	8.751	64.867	9.666
Minimum	0.000	0.000	0.558	0.000	0.000	3.838	1.786	-3.962	-14.296
Std. dev.	0.184	0.169	0.162	6.051	202.463	0.930	0.876	4.183	2.147
Skewness	9.268	1.570	6.036	3.896	12.261	0.355	0.023	8.998	-1.126
Kurtosis	140.273	4.192	60.324	24.345	210.832	2.621	2.942	108.867	10.422
Jarque-Bera[a]	2,723,823*	1,602***	488,318*	73,471*	6,231,697*	92*	0.793	1,640,852*	8,560*
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.673)	(0.000)	(0.000)
Unbalanced Panel Unit Root Test[b] (Maddala and Wu, 1999)									
Level	8,783.19+	3,377.46+	4,395.95+	3,328.94+	3,586.62+	2,739.39+	3,239.41+	6,306.41+	1,399.51+
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
First difference	6,380.86+	3,246.98	3,445.38+	2,863.67+	3,098.94+	2,877.72+	2,974.96+	2,312.61+	1,371.51+
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 2 (cont.). Descriptive statistics

Statistics	σ_{ROE}	σ_{ROA}	Keeley's *Q*	*Holdings*	*Holdings*^{2}	Log (*total earnings*)	Log (*total loans*)	Inflation rate (%)	GDP growth rate (%)
Unbalanced Panel Unit Root Test[b] (Maddala and Wu, 1999)									
# of observations	3,407	3,407	3,415	3,415	3,415	3,415	3,412	3,415	3,415
# of banks	867	867	867	867	867	867	867	867	867
# of countries	43	43	43	43	43	43	43	43	43

Note: [a]Jarque-Bera is the Jarque-Bera Normality Test. *Represents the rejection of the null hypothesis of normality at the 1% significance level. [b] + Denotes the rejection of the null hypothesis of unit root.

4.2. Unbalanced panel unit root test. Table 2 also reports the results of the unit root test for the unbalance panel data proposed by Maddala and Wu (1999). The x^2 statistics indicate that all variables can be strongly significant to reject the unit root hypothesis at the 1% confidence level. Therefore, this panel unit root test confirms the stationarity of all variables.

4.3. Factors influencing bank's risk-taking. Table 3 documents the comprehensive results of different econometric estimation using OLS, GLS (both random effect and fixed effect), and GMM (both difference and system estimation with one-step and two-step) to test which can better control endogeneity bias. Note worthily, results based on the two-step system GMM, using the Windmeijer (2005) robust correction for the variance, are reported comparatively more efficient and significant than other methodology in most parameters. Also both the Sargan (1958) and the AR (2) test statistics do not signal major specification problems in most specifications. Hence, I mainly document the main finding according to the results from the system GMM with two-step estimation.

Table 3. Determinants of bank's risk-taking behavior

Independent variables	Econometric methodology						
	OLS (Ordinary least square)	GLS (Generalized least square)		Difference GMM (Generalized method of moments)		System GMM (Generalized method of moments)	
		Random effect	Fixed effect	One-step estimation	Two-step estimation	One-step estimation	Two-step estimation
Panel A: Dependent variable = Standard deviation of return on equity ($\sigma ROE_{i,j,t}$)							
Constant	-0.03 (0.31)	0.06 (0.25)	0.55*** (0.00)	0.01 (0.64)	0.01 (0.42)	-0.21*** (0.00)	-0.15*** (0.00)
$\sigma_{ROEi,j,t-1}$	-	-	-	-	-	0.66*** (0.00)	0.72*** (0.00)
$\Delta\sigma_{ROEi,j,t-1}$	-	-	-	0.29*** (0.00)	0.29*** (0.00)	-	-
Charter Value							
Keeley's $Q_{i,j,t}\times10$	-0.20 (0.32)	-0.12 (0.56)	-0.07 (0.76)	-	-	-0.39** (0.04)	-0.24** (0.01)
Δ*Keeley's* $Q_{i,j,t}\times10$	-	-	-	-0.09 (0.57)	-0.28 (0.24)	-	-
Ownership Structure							
$Holdings_{i,j,t}\times10^2$	-0.04 (0.72)	-0.04 (0.83)	-0.32 (0.42)	-	-	-0.43*** (0.00)	-0.36*** (0.00)
$\Delta Holdings_{i,j,t}\times10^2$	-	-	-	-0.37 (0.36)	-0.01* (0.09)	-	-
$Holdings^2{}_{i,j,t}\times10^3$	-0.05 (0.12)	-0.03 (0.54)	-0.04 (0.54)	-	-	0.07*** (0.00)	0.05** (0.05)
$\Delta Holdings^2{}_{i,j,t}\times10^3$	-	-	-	0.04 (0.66)	0.08* (0.09)	-	-
Dummy Bank Holding Company $_{i,j,t}$	0.69* (0.07)	0.15* (0.09)	-	0.13 (0.92)	0.05 (0.95)	0.53*** (0.00)	0.38*** (0.00)
Dummy Commercial Bank $_{i,j,t}$	0.06*** (0.00)	0.07*** (0.00)	-	0.05 (0.72)	0.01 (0.92)	0.11*** (0.00)	0.06*** (0.00)
Dummy Cooperative Bank $_{i,j,t}$	-0.02 (0.33)	-0.01 (0.73)	-	-0.03 (0.85)	-0.03 (0.71)	-0.54*** (0.00)	-0.41** (0.02)
Dummy Investment Bank $_{i,j,t}$	0.07*** (0.00)	0.05 (0.08)	-	0.01 (0.53)	0.01 (0.32)	0.49*** (0.00)	0.26** (0.02)
Dummy Saving Bank $_{i,j,t}$	-0.68 (0.74)	-0.34 (0.94)	-	-0.47 (0.75)	-0.27 (0.76)	-1.02 (0.75)	-2.43 (0.71)
Bank Characteristics							
Log (*total loans*)$_{i,j,t}$	0.01 (0.27)	0.02 (0.18)	0.06*** (0.00)	-	-	0.12*** (0.00)	0.05*** (0.01)
ΔLog (*total loans*) $_{i,j,t}$	-	-	-	0.05*** (0.00)	0.03 (0.12)	-	-
Log (*total earnings*) $_{i,j,t}$	-0.40 (0.61)	-1.47 (0.19)	-0.02 (0.29)	-	-	-0.09*** (0.00)	-0.03** (0.04)
ΔLog (*total earnings*)$_{i,j,t}$	-	-	-	-0.40 (0.79)	-0.72 (0.56)	-	-
Macroeconomic Conditions							
GDP growth rate$_{j,t}\times10^2$	-0.01*** (0.00)	-0.28*** (0.00)	-0.30*** (0.00)	-	-	-0.28*** (0.00)	-0.13* (0.06)
ΔGDP growth rate $_{j,t}\times10^2$	-	-	-	-0.12 (0.17)	-0.06 (0.46)	-	-
Inflation rate $_{j,t}\times10^2$	0.02 (0.77)	0.05 (0.59)	0.02 (0.89)	-	-	0.54*** (0.00)	0.29*** (0.00)
ΔInflation rate $_{j,t}\times10^2$	-	-	-	0.42*** (0.00)	0.41** (0.02)	-	-
R^2	0.044	0.037	0.005	-	-	-	-

Table 3 (cont.). Determinants of bank's risk-taking behavior

Independent variables	Econometric methodology						
	OLS (Ordinary least square)	GLS (Generalized least square)		Difference GMM (Generalized method of moments)		System GMM (Generalized method of moments)	
		Random effect	Fixed effect	One-step estimation	Two-step estimation	One-step estimation	Two-step estimation
Panel A: Dependent variable = Standard deviation of return on equity ($\sigma ROE_{i,j,t}$)							
Macroeconomic Conditions							
Sargan test (H0: overidetification)	-	-	-	6.71 (0.89)	4.99 (0.91)	2.70 (0.95)	9.83 (0.73)
Arellano-Bond Autocorrelation Test							
AR(1) (H0: no first-order autocorrelation)	-	-	-	-8.93*** (0.00)	-2.67*** (0.01)	-12.25*** (0.00)	-3.16*** (0.00)***
AR(2) (H0: no second-order autocorrelation)	-	-	-	-2.47*** (0.01)	-1.85* (0.06)	-1.81 (0.07)	-1.48 (0.14)
# of observations	3,404	3,404	3,404	1,695	1,695	2,517	2,517
# of banks	867	867	867	742	742	818	818
# of countries	43	43	43	43	43	43	43
Panel B: Dependent variable = Standard deviation of return on assets ($\sigma_{ROA\ i,j,t}$)							
Constant	-0.06 (0.13)	-0.06 (0.11)	2.86*** (0.00)	-0.53 (0.35)	0.44 (0.96)	-0.49* (0.08)	-0.25** (0.03)
$\sigma_{ROA\ i,j,t-1}$	-	-	-	-	-	-0.78* (0.09)	-0.53** (0.05)
$\Delta\sigma_{ROA\ i,j,t-1}$	-	-	-	-0.20*** (0.00)	-0.22* (0.06)	-	-
Charter Value							
Keeley's Q $_{i,j,t}\times10$	-0.45** (0.02)	0.04** (0.02)	-0.16*** (0.00)	-	-	-0.95 (0.58)	-0.11* (0.06)
Δ*Keeley's Q* $_{i,j,t}\times10$	-	-	-	-0.68 (0.94)	-0.15 (0.51)	-	-
Ownership Structure							
Holdings $_{i,j,t}\times10^2$	-0.06 (0.58)	-0.06 (0.65)	-0.77 (0.42)	-	-	0.15 (0.13)	0.10 (0.08)*
Δ*Holdings* $_{i,j,t}\times10^2$	-	-	-	-0.42 (0.82)	-0.36 (0.46)	-	-
Holdings $^2_{i,j,t}\times10^3$	0.02 (0.59)	0.02 (0.67)	0.02 (0.87)	-	-	-0.27 (0.12)	-0.19* (0.08)
Δ*Holdings* $^2_{i,j,t}\times10^3$	-	-	-	0.34 (0.93)	0.07 (0.39)	-	-
Dummy $_{Bank\ Holding\ Company\ i,j,t}$	0.05 (0.86)	0.48 (0.85)	-	0.18 (0.98)	0.08 (0.36)	0.56** (0.05)	0.30** (0.03)
Dummy $_{Commercial\ Bank\ i,j,t}$	0.12 (0.66)	0.12 (0.62)	-	0.21 (0.73)	0.10 (0.91)	0.56** (0.05)	0.29** (0.03)
Dummy $_{Cooperative\ Bank\ i,j,t}$	-0.06 (0.84)	-0.63 (0.84)	-	-0.19 (0.78)	-0.51 (0.30)	-0.92** (0.02)	-0.63** (0.04)
Dummy $_{Investment\ Bank\ i,j,t}$	0.01 (0.73)	0.01 (0.71)	-	0.03 (0.96)	0.10 (0.40)	0.57** (0.05)	0.30** (0.03)
Dummy $_{Saving\ Bank\ i,j,t}$	-0.27 (0.93)	-0.27 (0.93)	-	-0.07 (0.92)	-0.07 (0.94)	-0.54* (0.06)	-0.29** (0.04)
Bank Characteristics							
Log (*total loans*) $_{i,j,t}$	0.15** (0.05)	0.15* (0.06)	0.28*** (0.00)	-	-	-0.12 (0.14)	-0.83* (0.09)
ΔLog (*total loans*) $_{i,j,t}$	-	-	-	0.80 (0.36)	0.59 (0.89)	-	-
Log (*total earnings*) $_{i,j,t}$	-0.034*** (0.00)	-0.35*** (0.00)	-0.19*** (0.00)	-	-	-0.41 (0.64)	-0.48* (0.03)
ΔLog (*total earnings*) $_{i,j,t}$	-	-	-	-0.19*** (0.01)	-0.12*** (0.01)	-	-
Macroeconomic Conditions							
GDP growth rate $_{j,t}\times10^2$	-0.35*** (0.01)	-0.35** (0.04)	-0.48** (0.03)	-	-	-0.08 (0.11)	-0.04** (0.04)
Δ*GDP growth rate* $_{j,t}\times10^2$	-	-	-	-0.18 (0.66)	-0.14 (0.90)	-	-
Inflation rate $_{j,t}\times10^2$	0.26*** (0.00)	0.27*** (0.00)	0.87*** (0.00)	-	-	-0.04 (0.34)	0.02** (0.05)
Δ*Inflation rate* $_{j,t}\times10^2$	-	-	-	-0.53 (0.35)	-0.24 (0.30)	-	-
R^2	0.022	0.022	0.006	-	-	-	-
Sargan test (H_0: overidetification)	-	-	-	14.33 (0.75)	12.26 (0.83)	8.34 (0.96)	8.45 (0.95)
Arellano-Bond Autocorrelation Test							
AR(1) (H_0: no first-order serial autocorrelation)	-	-	-	-5.56*** (0.00)	-1.28 (0.20)	-1.22 (0.22)	-1.24 (0.22)
AR(2) (H_0: no second-order auto-correlation)	-	-	-	-0.08 (0.93)	1.02 (0.31)	-0.18 (0.86)	-0.09 (0.93)
# of observations	3,404	3,404	3,404	1,695	1,695	2,517	2,517
# of banks	867	867	867	742	742	818	818
# of countries	43	43	43	43	43	43	43

Note: All estimations are undertaken in Stata 9 and denotes the operation of first differences. The p-values are shown in parentheses. ***, ** and * indicate parameter significance at the 1%, 5% and 10% significance levels, respectively.

Panel A of Table 3 presents the empirical results when the standard deviation of ROE ($\sigma_{ROEi,j,t}$) is used as the dependent variable. The estimated coefficient of a lagged one year for the standard deviation of

ROE ($\sigma_{ROEi,j,t\text{-}1}$) is positive and statistically significant at the 1% level, implying that in the bank's risk taking behavior there is a dynamic adjustment process – a risky bank now has more incentive to take excessive risk in turn. The coefficient of the charter value (*Keeley's* $Q_{i,j,t}$) is -0.24, negative and is significant to indicate that a 0.02% decrease in the charter value reduces the total risk by 0.02%. The negative correlation between the charter value and the bank's risk suggests that the franchise value can help reduce excessive risk-taking in banking.

The coefficients of *Holding* and *Holding*^{2} are negative and positive, respectively, and both coefficients are marginally significant. The results indicate that the relationship between the ownership by stable shareholders and the level of bank risk is nonlinear; the risk decreases initially with the ownership by stable shareholders, and then starts to increase after a certain level of ownership. Those results suggest that the negative effect of managerial entrenchment on the bank risk dominates the positive asset substitution effect for stable shareholders with a relatively small ownership, and vise versa for stable shareholders with a relatively large ownership. Moreover, the coefficients of all the dummy variables standing for the bank's ownership structure are remarkably statistically significant at the 1-10% levels. The result indicates that the bank holding company, commercial bank and investment bank have more tendencies to take risks, compared with cooperative and saving banking with negative coefficients. The current results are similar to the results obtained in García-Marco and Fernández (2007) who found Spanish Commercial banks more risk-inclined than Spanish Savings banks. Hesse and Čihák (2006) also document that cooperative banks are more stable than commercial banks.

The coefficient of Log (*total loans*)$_{i,j,t}$ is positive and significant in 1% level, suggesting that the bank with larger total loans is more capable of taking risks than the small one. Otherwise, the coefficient of Log (*total earnings*)$_{i,j,t}$ is negative and significant, indicating that the bank with more profit has the ability to better cover risks than the less profitable one. The results of macroeconomic conditions meet the expectations. The coefficient of (*GDP growth rate*$_{j,t}$) is negative and significant in 10%, presenting that a country with a higher GDP growth rate trends to more financial stability than a lower one. Similarly, the coefficient of (*Inflation rate*$_{j,t}$) is positive and greatly significant in 1%, presenting that a country with a lower inflation rate seems to induce bank risk-taking behavior than a higher one.

Conclusion and policy implication

Using new data combined bank level data and country level data over the period from 1998 to 2002, this paper empirically identifies the determinants of bank's risk-taking behavior by utilizing the dynamic panel data model. Factors influencing bank's risk-taking are Charter Value, Holdings, Ownership Structure and Bank Characters and Macroeconomic Conditions.

The major empirical findings suggest two points: first, the decline of franchise values increases bank risk; second, the relationship between the ownership by stable shareholders and bank risk is nonlinear; the risk decreases initially with the proportion of stable shareholders, and then increases as the asset substitution effect dominates the effect of managerial entrenchment on bank risk. The primary effect, however, is the risk-reducing managerial entrenchment effect.

Our findings have important policy implications as they imply that increasing stable shareholders' ownership have nonlinearly impacts on mitigating bank risk-taking. Internal managerial entrenchment is an important mechanism for banking supervisor to discourage the bank from taking more risk. Additionally, bank risk-taking significantly varies among different bank types, implying intensive monitoring on bank holding company, commercial bank, and investment bank.

References

1. Adams, R.B. (2001). The dual role of corporate boards as advisors and monitors of management: theory and evidence, Federal Reserve Bank of New York, Working Paper.
2. Adams, R.B. & Mehran, H. (2002). Board structure and banking firm performance, Federal Reserve Bank of New York, Working Paper.
3. Ahn, S. & Schmidt, P. (1995). Efficient estimation of models for Dynamic Panel Data, Journal of Econometrics, 68, pp. 5-27.
4. Alonso-Borrego, C. & Arellano, M. (1996). Symmetrically normalised Instrumental variable estimation using panel data, CEMFI Working Paper.
5. Arellano, M. & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, Review of Economic Studies, 58, pp. 277-297.
6. Arellano, M. & Bond, S. (1998). Dynamic panel data estimation using DPD98 for GAUSS – A guide for users, Madrid: CEMFI.
7. Arellano, M. & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models, Journal of Econometrics, 68, pp. 29-51.

8. Barth, J.R., Jr Caprio, G. & Levine, R. (2004). Bank regulation and supervision: what works best? Journal of Financial Intermediation, 13, pp. 205-248.
9. Besanko, D. & Kanatas, G. (1996). The regulation of bank capital: Do capital standards promote bank safety? Journal of Financial Intermediation, 5 (2), pp. 160-183.
10. Bhattacharya, S. & Thakor, A. (1993). Contemporary banking theory, Journal of Financial Intermediation, 3, pp. 2-50.
11. Bhattacharya, S., Boot, A. & Thakor, A. (1998). The economics of bank regulation, Journal of Money, Credit and Banking, 30 (7), pp. 45-770.
12. Blasko, M. & Sinkey, J.F. (2003). Bank asset structure, real-estate lending, and risk taking, Working Paper.
13. Blundell, R. & Bond, S. (1998). Initial conditions and moment restrictions in Dynamic Panel Data Models, Journal of Econometrics, 87, pp. 115-143.
14. Boyd, J., Graham, S. & Hewitt, R. (1993). Bank holding company mergers with non-bank financial firms: Effects on the risk of failure, Journal of Banking and Finance, 17, pp. 43-63.
15. Buser, S.A., Chen, A.H. & Kane, E.J. (1981). Federal deposit insurance, regulatory policy, and optimal bank capital, Journal of Finance, 36, pp. 51-60.
16. Calderon, C., Chong, A. & Loayza, N. (2000). Determinants of current account deficits in developing countries, World Bank Research Policy Working Paper.
17. Cebenoyan, A.S., Cooperman, E.S. & Register, C.A. (1999). Ownership structure, charter value, and risk-taking behavior for thrifts, Financial Management, 28, pp. 43-60.
18. Chung, K.H. & Pruitt, S.W. (1994). A simple approximation of Tobin's q, Financial Management, 23, pp. 70-74.
19. Claessens, S., Demirgüç-Kunt, A. & Huizinga, H. (2001). How does foreign entry affect domestic banking markets? Journal of Banking and Finance, 25 (5), pp. 891-911.
20. Collins, M.C., Blackwell, D.W. & Jr. Sinkey, J.F. (1994). Financial innovation, investment opportunities, and corporate policy choices for large Bank Holding Companies, Financial Review, 29, pp. 223-247.
21. Demirgüç-Kunt, A. & Detragiache, E. (2002). Does Deposit Insurance increase banking system stability? An empirical investigation, Journal of Monetary Economics, 49, pp. 1373-1406.
22. Demirgüç-Kunt, A. & Kane, E.J. (2002). Deposit Insurance around the world: Where does it work? Journal of Economic Perspectives, 16, pp. 175-195.
23. Demsetz, H. & Lehn, K. (1985). The structure of corporate ownership: Causes and consequences, Journal of Political Economy, 93, pp. 1155-1177.
24. Demsetz, R.S., Saidenberg, M.R. & Strahan, P.E. (1997). Agency problems and risk taking at banks, Reserve Bank of New York, Research Paper, No. 9709.
25. Demsetz, R.S., Saidenberg, M.R. & Strahan, P.E. (1996). Banks with something to lose: The disciplinary role of franchise value, FRBNY Economic Policy Review, 1-14.
26. Roodman, D. (2007). How to do xtabond2: An introduction to "Difference" and "System" GMM in Stata, Working Paper, Center for Global Development.
27. Dothan, U. & Williams, J. (1980). Banks, bankruptcy and public regulation, Journal of Banking and Finance, 4 (1), pp. 65-88.
28. Esty, B.C. (1997). Organizational form and risk-taking in the savings and loan industry, Journal of Financial Economics, 44, pp. 25-56.
29. Fama, E. (1980). Agency problems and the theory of the firm, Journal of Political Economy, 88, pp. 288-307.
30. Fluck, Z. (1999). The dynamics of the management-shareholder conflict, Review of Financial Studies, 12 (2), pp. 379-404.
31. Furlong, F.T. & Keeley, M.C. (1987). Bank capital regulation and asset risk, FRSF Economic Review, Spring, pp. 20-40.
32. Furlong, F.T. & Keeley, M.C. (1989). Capital regulation and bank risk taking: A note, Journal of Banking and Finance, 13 (6), pp. 883-891.
33. Galloway, T., Lee, W.B. & Roden, D. (1997). Banks' changing incentives and opportunities for risk-taking, Journal of Banking and Finance, 21, pp. 509-527.
34. García-Marco, T. & Robles-Fernández, M.D. (2008). Risk-taking behaviour and ownership in the banking industry: The Spanish evidence, Journal of Economics and Business, 60 (4), pp. 332-354.
35. Gaver, J.J. & Gaver, K.M. (1993). Additional evidence on the association between the investment opportunity set and corporate financing, dividend, and compensation policies, Journal of Accounting and Economics, 16, pp. 125-160.
36. Gaver, J.J. & Gaver, K.M. (1995). Compensation policy and the investment opportunity set, Financial Management, 24, pp. 19-32.
37. Gennotte, G. & Pyle, D. (1991). Capital controls and bank risk, Journal of Banking and Finance, 15 (4-5), pp. 805-824.
38. González, F. (2005). Bank regulation and risk-taking incentives: An international comparison of bank risk, Journal of Banking and Finance, 29, pp. 1153-1184.
39. Gorton, G. & Rosen, R. (1995). Corporate control, portfolio choice, and the decline of banking, Journal of Finance, 5, pp. 1377-1420.
40. Green, R.C. & Talmor, E. (1986). Asset substitution and the agency costs of debt financing, Journal of Banking and Finance, 10 (3), pp. 391-399.
41. Griliches, Z. & Hausman, J.A. (1986). Errors in variables in panel data, Journal of Econometrics, 31, pp. 93-118.

42. Gropp, R. & Vesala, J. (2004). Deposit insurance, moral hazard and market monitoring, Review of Finance, 8 (4), pp. 571-602.
43. Hannan, T. & Hanweck, G.A. (1988). Bank insolvency risk and the market for large certificates of deposit, Journal of Money, Credit and Banking, 20 (2), pp. 203-211.
44. Hendrickson, J.M. & Nichols, M.W. (2001). How does regulation affect the risk taking of banks? A U.S. and Canadian perspective, Journal of Comparative Policy Analysis: Research and Practice, 3, pp. 59-83.
45. Hesse, H. & Čihák, M. (2006). Cooperative banks and financial stability, IMF Working Paper.
46. Holtz-Eakin, D., Newey, W. & Rosen, H. (1990). Estimating Vector Autoregressions with panel data, Econometrica, 56 (6), pp. 1371-1395.
47. Im, K.S., Pesaran, M.H. & Shin, Y. (2003). Testing for unit roots in heterogeneous panels, Journal of Econometrics, 115 (1), pp. 53-74.
48. Jeitschko, T.D. & Jeung, S.D. (2005). Incentives for risk-taking in banking – A unified approach, Journal of Banking and Finance, 29, pp. 759-777.
49. Jensen, M. & Meckling, W. (1976). The theory of firm: Managerial behavior, agency costs and ownership structure, Journal of Financial Economics, 3, pp. 305-360.
50. Jensen, M.C. & Ruback, R. (1983). The market for corporate control: The scientific evidence, Journal of Financial Economics, 11(1), pp. 5-50.
51. Kahane, Y. (1977). Capital adequacy and the regulation of financial intermediaries, Journal of Banking and Finance, 1(2), pp. 207-218.
52. Kane, E.J. (2000). Designing financial safety nets to fit country circumstances, Boston College, Working Paper.
53. Kane, E.J. & Unal, H. (1990). Modeling structural and temporal variation in the market's valuation of banking firms, Journal of Finance, 45, pp. 113-136.
54. Kareken, J.H. & Wallace, N. (1978). Deposit insurance and bank regulation: A partial equilibrium exposition, Journal of Business, 51(3), pp. 413-438.
55. Keeley, M.C. (1990). Deposit insurance, risk, and market power in banking, American Economic Review, 80 (5), pp. 1183-1200.
56. Keeley, M.C. & Furlong, F.T. (1990). A reexamination of mean – variance analysis of bank capital regulation, Journal of Banking and Finance, 14 (1), pp. 69-84.
57. Kim, D. & Santomero, A.M. (1988). Risk in banking and capital regulation, Journal of Finance, 43 (5), pp. 1219-1233.
58. Koehn, M. & Santomero, A.M. (1980). Regulation of bank capital and portfolio risk, Journal of Finance, 35 (5), pp. 1235-1244.
59. Konishi, M. & Yasuda, Y. (2004). Factors affecting bank risk taking: Evidence from Japan, Journal of Banking and Finance, 28, pp. 215-232.
60. Laeven, L. (2002). Bank risk and deposit insurance, World Bank Economic Review, 16, pp. 109-137.
61. Lee, S.W. (2002). Insider ownership and risk-taking behaviour at Bank Holding Companies, Journal of Business Finance and Accounting, 29 (7-8), pp. 989-1005.
62. Lee, S.W. (2004). Regulation, corporate control and bank risk taking, Corporate Ownership and Control, 1(4), pp. 108-117.
63. Lindenberg, E.B. & Ross, S.A. (1981). Tobin's q ratio and industrial organization, Journal of Business, 54, pp. 1-32.
64. Maddala, G.S. & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test, Oxford Bulletin of Economics and Statistics, 61, pp. 631-652.
65. Marcus, A.J. (1984). Deregulation and bank financial policy, Journal of Banking and Finance, 8, pp. 557-565.
66. McConnel, J. & Servaes, H. (1990). Additional evidence on equity ownership and corporate value, Journal of Financial Economics, 27, pp. 595-612.
67. Merton, R.C. (1977). An analytic derivation of the cost of deposit insurance and loan guarantees, Journal of Banking and Finance, 1, pp. 3-11.
68. Morck, R., Shleifer, A. & Vishny, R. (1988). Management ownership and market valuation, Journal of Financial Economics, 20, pp. 293-315.
69. O'Hara, M. & Shaw, W. (1990). Deposit insurance and wealth effects: The value of being 'Too Big to Fail', Journal of Finance, 5, pp. 1587-1600.
70. Osborne, D.K. & Lee, S.W. (2001). Effects of deposit insurance reform on moral hazard in U.S. banking, Journal of Business Finance and Accounting, 28 (7/8), pp. 979-992.
71. Park, S. (1997). Risk-taking behavior of banks under regulation, Journal of Banking and Finance, 21 (4), pp. 491-507.
72. Perfect, S.B. & Wiles, K.W. (1994). Alternative constructions of Tobin's q: An empirical comparison, Journal of Empirical Finance, 1 (3/4), pp. 313-341.
73. Sargan, J.D. (1958). The estimation of economic relationships using instrumental variables, Econometrica, 26, pp. 395-415.
74. Saunders, A., Strock, E. & Travlos, N.G. (1990). Ownership structure, deregulation, and bank risk taking, Journal of Finance, 45 (2), pp. 643-654.
75. Scharfstein, D. (1988). The disciplinary role of takeovers, Review of Economic Studies, 55, pp. 185-200.
76. Sharpe, W.F. (1978). Bank capital adequacy, deposit insurance and security values, Journal of Financial and Quantitative Analysis, 13 (4), pp. 701-718.

77. Shleifer, A. & Vishny, R.W. (1986). Large shareholders and corporate control, Journal of Political Economy, 94, pp. 461-488.
78. Strock, E. & Travlos, N.G. (1990). Ownership structure, deregulation, and bank risk taking, Journal of Finance, 2, pp. 643-654.
79. Suarez, J. (1994). Closure rules, market power and risk-taking in a dynamic model of bank behaviour, London School of Economics, Working Paper.
80. Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators, Journal of Econometrics, 126 (1), pp. 25-51.

Appendix

Table A1. Sample distribution by country

Country	Number of bank	Number of observations
Argentina	5	19
Australia	9	44
Austria	6	27
Belgium	5	21
Brazil	5	23
Canada	9	42
Chile	3	14
Colombia	1	5
Denmark	34	155
Egypt	3	15
Finland	3	13
France	31	115
Germany	17	62
Greece	9	42
Hong Kong	12	44
India	6	20
Indonesia	8	21
Ireland	4	20
Israel	2	6
Italy	32	138
Japan	108	466
Jordan	7	35
Kenya	3	9
Korea	16	47
Malaysia	10	41
Mexico	2	9
Netherlands	5	24
Norway	16	60
Pakistan	2	10
Peru	6	20
Philippines	10	45
Portugal	6	28
Singapore	6	21
South africa	11	44
Spain	16	71
Sweden	5	21
Switzerland	16	60
Taiwan	15	55
Thailand	13	52
Turkey	8	14
United Kingdom	15	58
USA	362	1,364
Venezuela	6	15
Total	868	3,415