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Published in:
Journal of International Financial Markets, Institutions and Money

DOI:
10.1016/j.intfin.2021.101466

Publication date:
2021

J. Int. Financ. Markets Inst. Money 75 (2021) 101466

Contents lists available at ScienceDirect

Journal of International Financial Markets, Institutions & Money

journal homepage: www.elsevier.com/locate/intfin

Risk governance and bank risk-taking behavior: Evidence from Asian banks

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ARTICLE INFO

Keywords:
Risk governance
Risk-taking
Performance
State-owned banks
Privately-owned banks
Asia

ABSTRACT

We investigate how risk committee and Chief Risk Officer's characteristics affect the risk-taking behavior of Asian commercial banks in the aftermath of the global financial crisis. Using a sample of 1480 observations representing 185 banks from year 2010 to 2017, we find evidence of a negative and significant link between the risk governance mechanisms and risk-taking. This link is however more pronounced for privately-owned banks (POBs) than for state-owned banks (SOBs). Moreover, risk governance mechanisms positively influence the performance of POBs but have no impact on performance of SOBs. Overall, our results show the role of risk governance mechanisms in curbing excessive risk-taking and improving risk management effectiveness and performance of Asian banks, with some differences across the SOBs and POBs.

1. Introduction

Financial institutions globally have racked up about $400 billion in fines and penalties since the 2007–2008 (S&P Global, 2020).[1] The global financial crisis has highlighted the need for strengthening of governance mechanisms of financial institutions (Addo et al., 2021). Weaknesses in the risk governance structures and excessive risk-taking by banks have been identified as the key determinants of recent financial crisis (Battaglia & Gallo, 2015; Erkens et al., 2012). Risk governance is a subset of corporate governance decisions and actions, which ensures effective risk management. The main reason for broad policy problems is the lack of board oversight for the portfolio of risks faced by an enterprise. After the global financial crisis, policymakers and regulators have stressed on improvement of risk governance and effective risk management within banks (Lundqvist, 2015). Risk governance frameworks involve the creation of a dedicated board-level risk committee (RC) and the appointment of a chief risk officer (CRO), who oversees all the relevant risks faced by an organization (Aebi et al., 2012). Research concerning the role of such risk governance mechanisms in effective risk management is however limited.

Furthermore, very little is known about the role of corporate governance in banking sectors of developing economies. Keeping in

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[1] https://www.spglobal.com/marketintelligence/en/news-insights/trending/cg9b4mhc6revpg5jnhqgxa2

https://doi.org/10.1016/j.intfin.2021.101466
Received 25 May 2021; Accepted 2 November 2021
Available online 9 November 2021

view this literature void, our study develops an empirical framework to better understand the risk-taking and risk governance of Asian banks during post-global financial crisis period.[2] The soundness of financial system, deregulation, interest rate liberalization, and removal of credit allocation has been on the reform agenda over the past decade in Asian countries (Battaglia & Gallo, 2015). Asian economies are characterized by weaker investor protection, poor enforcement mechanisms and regulatory quality, and political interference (La Porta et al., 2000; Dong et al., 2014). These business settings further invigorate the need of risk governance structures for Asian banks to ensure financial stability and performance.

Financial institutions have their own peculiarities such as opaqueness, leverage, regulation, and intervention by the government, which require a distinct investigation of governance issues (Srivastav & Hagendorff, 2016; Abdelbadie & Salama, 2019). Additionally, one uncommon feature of the Asian banking system is the state ownership of commercial banks (Cornett et al., 2010). The difference in the ownership structure of banks can have a bearing on the effectiveness of risk management procedures and governance quality. Privately-owned banks (hereafter POBs) are driven by the profit and wealth maximization principle, while state-owned banks (hereafter SOBs) are guided by the principle of socio-economic development for political purposes (Iannotta et al., 2007; Duqi & Al-Tamimi, 2018). The Asian region thus provides a unique context for exploring the impact of risk governance mechanisms on risk-taking and performance of banks while considering ownership status (SOBs vs. POBs).

Although, the significance of risk management function is acknowledged in the banking industry and provided in the Basel Committee regulatory framework, yet there is limited empirical evidence on the effectiveness of risk governance within the corporate governance structure, particularly in the context of Asian banks for the post-financial crisis period. Only a few studies have examined the impact of risk governance mechanisms on bank risk management (Ellul & Yerramilli, 2013; Tao & Hutchinson, 2013; Aljughaiman & Salama, 2019). However, these studies have only investigated the impact of risk governance on specific risk types such as credit risk or market risk, with the exception of Aljughaiman & Salama (2019). Malik et al. (2020) also suggest that the study of risk governance impact on bank risk-taking should thus be expanded to include more risks simultaneously to consider bank-wide risk management.

We therefore adopt a comprehensive view on bank risk-taking and examine the impact of risk governance mechanisms on bank performance and various critical risk perspectives, namely credit, liquidity, insolvency, and operational risk.[3] Considering the tendency of governments to own and operate commercial banks in Asia (Cornett et al., 2010) and different motives (shareholders' wealth maximization or political interests) of POBs and SOBs, we also investigate whether the impact of risk governance mechanisms on risk-taking behavior and financial performance vary across POBs and SOBs. Based on the sample of 1480 bank-year observations representing 185 banks, we initially find that risk governance mechanisms have a negative association with bank risk-taking but no significant association with financial performance for the whole sample. With regard to the impact of ownership status, the results of our subsample analysis reveal that risk governance mechanisms significantly reduce risk-taking in POBs but are less relevant for SOBs. In addition, risk governance mechanisms are found to improve financial performance of the POBs, while they have no effect on SOB performance. Our findings are controlled for potential endogeneity concerns and robust to alternate sample composition, and estimation methods.

Overall, this study contributes to the existing literature in several ways. First, to the best of our knowledge, our study is one of the pioneer examinations of the association between risk governance mechanisms and bank risk-taking in Asian context. Second, we adopt a more comprehensive approach by considering multiple risks simultaneously which allows us to capture the influence of risk governance mechanisms on bank wide risk management. Third, we contribute to the scant literature on risk governance, ownership structure (POBs and SOBs) and bank risk-taking (Dong et al., 2014; Samet et al., 2018) by showing that ownership status moderates the relation between risk governance mechanisms and bank risk-taking. In particular, risk governance mechanisms are more effective at reducing risk and improving financial performance in POBs. Finally, we extend the work of Aljughaiman & Salama (2019) by conducting a comprehensive comparative analysis of state owned and privately owned Asian banks.

The remainder of the paper is organized as follows: In the next section, we review the related literature and present our hypotheses. We then discuss our data, methodology, and variables in third section. Section 4 presents the results. Finally, we present the conclusion in section 5.

2. Prior evidence and hypotheses development

2.1. Risk governance and bank risk-taking

The relationship between governance mechanisms and risk management has gained great attention from governance researchers (Berger et al., 2014: Safiullah & Shamsuddin, 2019; Koirala et al., 2020). Prior research has stressed the importance of risk management functions, risk governance and the identification of risks in financial institutions (Stulz, 2008; Ellul & Yerramilli, 2013). Moreover, to the avoidance of excessive risk-taking since the risks cannot be managed entirely by enforcing market discipline or regulatory supervision (Addo et al., 2021). In this research vein, Ellul and Yerramilli (2013) constructed a risk management index to examine the strength and independence of risk management functions in US bank holding companies. Their findings show that banks with higher risk management indices are less exposed to private level mortgage-backed securities, traded lesser off-balance sheet

[2] The countries included in our sample are Bangladesh, China, India, Japan, Malaysia, Pakistan, Saudi Arabia, South Korea, Sri Lanka, Thailand, Turkey and United Arab Emirates.

[3] Risk governance mechanisms include the presence of risk committee, size of the risk committee, the number of risk committee meetings, the presence of chief risk officer and the independence of chief risk officer.

derivatives, have lower downgrade risk, lower credit risk and higher Sharpe ratio during the financial crisis. Similarly, Aebi et al. (2012) show that presence of risk governance structure in general and chief risk officer in particular have positive influence on stock returns. They further note that standard corporate governance mechanisms are not significantly related to stock returns and financial performance.

Similarly, Battaglia and Gallo (2015) studied the effect of board and risk management related corporate governance structures on financial performance for a sample of selected Chinese and Indian listed banks during the financial crisis period. Their findings reveal that risk committee size is positively related to accounting performance but negatively related to market valuation, while number of risk committee meetings is positively associated with market valuation. Using a sample of FTSE350 listed firms in the UK from 2012 to 2015, Malik et al. (2020) show that effectiveness of enterprise risk management (ERM) is positively associated with firm performance. They further concluded that strong board-level risk committee (BLRC) complements this relationship and increases the firm performance effects of ERM. Similarly, Hines and Peters (2015) in a study of financial institutions found that risk committee (RC) is used as a governance mechanism to fulfil symbolic roles and to help the maintenance and substantiation of legitimacy over risk activities.

More recently, Ames et al. (2018) provide evidence that insurance firms use RC as effective governance mechanism to oversee risk activities to improve financial strength ratings and performance. In the Asian context, Hunjra et al. (2021) and Zheng & Das (2018) report that corporate governance mechanisms significantly affect banks' performance and risk-taking. Collectively, these studies suggest that markets react favorably to the existence of risk governance and corporate governance mechanisms. Based on the above discussion and previous studies (Aebi et al., 2012; Aljughaiman & Salama, 2019), we focus on the presence and characteristics of the board-level risk committee (RC) and chief risk officer (CRO) to examine the relation between risk governance and bank risk-taking. The above discussion shows that risk governance mechanisms are vital for effective management of various organizational risks. However, how these risk governance mechanisms function in the banking sector is still an empirical question.

2.1.1. Board-level risk committee and bank risk-taking

Banks are subjected to various types of risks (e.g., credit, operational, insolvency, and liquidity risks) during their operations. Factors such as leverage levels and the considerable mismatch between assets and liabilities make banks more complex and opaquer than non-financial firms (Srivastav & Hagendorff, 2016; Abdelbadie & Salama, 2019). Because of higher exposure to different risks and business complexity, a separate risk committee has become more prevalent in the banking sector (Andres & Vallelado, 2008). The function of a dedicated board-level risk committee is to identify, manage and minimize various risks being faced by banks (Hines & Peters, 2015; Erkens et al., 2012; Cerasi et al., 2020).

Risk committee improves bank level risk governance by integrating an enterprise risk management (ERM) approach and making policy recommendations on risk strategy, appetite and tolerance level thus promoting an organizational risk awareness culture (Brown et al., 2009; Aebi et al., 2012; Malik et al., 2021). Battaglia and Gallo (2015) indicate that risk committee signifies stronger risk management and therefore effective corporate governance. Brancato et al. (2006) provide evidence of the positive effect of a control committee in reducing bank risk and increasing profitability. Lee and Hooy (2020) also find that board monitoring committee reduces the risk-taking in state-owned banks. In the same vein, Mongiardino & Plath (2010) show that risk management practices followed by the risk committee ensure stability and banking performance.

Based on the previous empirical studies, it is reasonable to assume that an effective risk management function can limit excessive risk-taking (Ellul & Yerramilli, 2013). Banks can use risk committee as an effective risk governance mechanism to oversee risk-taking activities. We can further infer that the presence of dedicated risk committee will negatively affect the excessive risk-taking of banks. This negative relationship is further augmented by the possibility that the risk committee members perform conservatively to reduce legal liability in case of any default (Pathan, 2009). Risk committee also signals a board's commitment to manage risks effectively. The establishment of risk committee also ensures the stakeholders such as regulators and rating agencies that the bank's risk profile is within acceptable limits (Bugalla et al., 2012). Existing evidence show that risk committee is associated with better performance ratings (Ames et al., 2018).

Risk management has been touted as having significant influence on the extent to which firms were affected by the crisis (Brunnermeier, 2009). The major reason for the crisis was excessive risk-taking strategies adopted by certain financial institutions (Addo et al., 2021). Risk governance mechanisms are therefore required to mitigate the risks inherent in the banks' operations. A dedicated board-level risk committee prevents aggregation and duplication of risks, employs natural hedge through strategic focus, improve information quality and transparency thus ensuring effective risk management and reducing bank risk taking (Farrell & Gallagher, 2015; McShane et al., 2011). Based on the above arguments, we propose the following hypothesis:

H1a: The presence of a board-level risk committee is negatively associated with bank risk-taking.

2.1.2. Risk committee size and risk-taking

The size of risk committee represents board's resource investment in the risk management oversight process. According to agency theory, a large risk committee can lead to group conflict and free rider problems (Jensen, 1993) that may lead to poor information communication, lower information quality, fragmented, and suboptimal decision making. In contrast, resource dependency theory suggests that large risk committees improve the monitoring effectiveness because a large risk committee represent diversity of opinion, expertise, and robust decision-making process (Malik et al., 2021). Previous literature identifies that large boards and audit committees are associated with improved financial transparency, reliability, and reduced debt financing costs (Anderson et al., 2004). Similarly, a large risk committee indicate strong risk governance (Hines et al., 2015; Malik et al., 2021), improved risk communication and reduced information asymmetries. Thus, we expect risk committee size to be negatively related to bank risk taking and propose the

following hypothesis:

H1b: Risk committee size is negatively associated with bank risk-taking.

2.1.3. Risk committee meetings and risk-taking

The frequency of board meetings is an indication of the active involvement of the board in strategic decision making. Hussain et al. (2018) and Adams and Ferreira (2007) argue that board meetings are important channels through which directors obtain firm-specific information and fulfill their monitoring roles. In line with this view, more frequent meetings may provide risk committee member the opportunity to deliberate and discuss ideas on managerial monitoring, risk mitigation strategies and ERM policies. Therefore, the number of risk committee meetings might be perceived as a proxy of the timely response and vigilance of risk committee. Previously, Battaglia and Gallo (2015) report a positive relationship between risk committee meetings and market performance of banks, suggesting that more frequent risk committee meetings represent a mechanism for effective risk communication, strong monitoring, in-depth deliberation, and robust risk management oversight. We therefore propose following hypothesis:

H1c: The number of risk committee meetings is negatively related with bank risk-taking.

2.1.4. Chief risk officer (CRO) position and risk-taking

The appointment of a CRO is an assignment of the responsibility to oversee all the relevant risks being faced by the bank (Brancato et al., 2006). The ERM literature shows that ERM implementation needs nomination of a risk champion in the firm (Liebenberg & Hoyt, 2003). The CRO is considered as risk champion and responsible for ERM implementation and coordination (Liebenberg & Hoyt, 2003). ERM adoption is associated with improved financial performance and effective risk management strengthen the association among ERM adoption and firm performance (Malik et al., 2020). We thus argue that the CRO charged with the responsibility of overseeing ERM should increase its effectiveness by focusing on significant risks, improving risk management coordination and communication, integrating risk management approaches, and lowering the level of bank wide risk-taking. Contrarily, banks can also benefit from excessive risk-taking (Sun and Liu, 2014). Banks with distinct and robust risk governance structures such as the CRO position can assume more risks (Mollah et al., 2017) to increase profits as well as to maximize shareholders' wealth (Aebi et al., 2012), suggesting that a positive relationship between the CRO position and bank risk-taking is also plausible. We therefore propose an exploratory hypothesis.

H1d: CRO position is associated with bank risk-taking.

2.1.5. CRO independence and risk-taking

Prior evidence suggests that independence of CRO is a critical factor in maintaining the effectiveness of risk management oversight (Aebi et al., 2012). CRO is considered independent if CRO is directly reporting to the shareholders and is a member of the governance board. An independent CRO can function with objectivity and exercise prudence in risk management functions. In this regard, Addo et al. (2021) recently show that board independence significantly reduces long-run expected marginal short-fall among systemically important European banks. Theoretically, the agency theory posits that independent directors are able to make efficient and unbiased corporate decisions and exercise improved monitoring (Anderson et al., 2004). Along similar lines, we argue that an independence of the CRO is vital to board and risk management (Magee et al., 2019; Protiviti, 2011). We therefore expect that an independent CRO is likely to make efficient, unbiased, and objective risk management decisions to improve risk oversight and reduce excessive bank risk-taking.

H1e: CRO independence is negatively associated with bank risk-taking.

2.2. Risk governance and bank performance

In line with the risk-return tradeoff perspective, effective risk management entails that risk-taking should be related to firm performance. Higher risks should only be accepted when the marginal increase in profitability exceeds the marginal increase in risks. Risk governance mechanisms are put in place to oversee risk assessment, risk mitigation and management practices, which could affect bank risk-taking behavior. Brancato et al. (2006) and Lee & Hooy (2020) report that the presence of a risk committee is likely to decrease bank risk and increase financial performance. Similarly, Mongiardino & Plath (2010) suggest that management practices by the risk committee ensure stability and banking performance. Additionally, Battaglia & Gallo (2015) provide evidence that robust governance structures are positively associated with bank performance.

Theoretically, shareholders can induce the bank management to engage in risky investments (Sun & Liu, 2014) that may not yield higher returns for the given level of risk. Management can also become conservative in risk-taking strategies if the board level risk committee and CRO are assertive in limiting risk-taking and overly keen to mitigate risk. Because of the regulatory pressures and increasing vigilance for risk oversight, managers are concerned about their reputational capital in the job market and penalty payments or settlements in case of oversight failure (Sun & Liu, 2014). Furthermore, unlike shareholders, manager do not have the liberty to diversify their employment risk (Addo et al., 2021). Such over-conservative risk governance practices may result in sub-optimal investments (rejecting an investment that could generate a marginal increase in returns for a less-marked marginal increase in risk) which could potentially lower the bank performance. In a related study, Aslam and Haron (2020) document a negative relation

between risk management committee and performance of Islamic banks in Asian countries.

Taken together, these studies suggest that risk governance mechanisms may be either positively or negatively associated with bank performance. However, this confusion has further increased in the aftermath of financial crisis due to several reasons. First, financial institutions suffered huge losses in the crisis period due to high risk-taking. Therefore, financial institutions would avoid investments in the risky projects. Second, investors may refrain from financing risky projects even for higher return to avoid similar consequences. Finally, the quality of risk governance mechanisms has significantly improved after the financial crisis and the main purpose of risk governance mechanisms is to oversee the risk-taking behavior of managers. Suggesting that risk governance mechanisms may oversee the risk-taking effectively but may not have any effect on financial performance due to the higher tendency of financial institutions to be risk-averse in the aftermath of financial crisis. We therefore propose the following exploratory hypothesis:

H2: Risk governance mechanisms are associated with bank performance.

2.3. Ownership status, bank risk-taking, and performance

Extant banking literature argues that state ownership of commercial banks breeds inefficiencies in banking operations (La Porta et al., 2002). The major concern about state ownership of banks is related to the credit portfolio, loan availability and distribution, and performance. Such banks are characterized by inefficiencies and a high ratio of non-performing loans (Sapienza, 2004). This tendency is far more pervasive in emerging markets. State-owned banks in developing economies are also deemed less profitable compared to their counterparts in high income countries. A possible reason is that developing countries are ill equipped than high income countries to cope with distortions arising from the state ownership of commercial banks (Djebali & Zaghdoudi, 2020). Barry et al. (2011) argue that state owned banks are subject to greater market discipline and benefit from superior access to capital markets, which affects their risk-taking behavior. Moreover, because state owned banks have easier access to capital markets to finance their growth opportunities, they have more incentives to take risk.

Among the different ownership types, state ownership of financial institutions has attracted great scholarly attention (e.g., Angkinand & Wihlborg, 2010; Xiao & Zhao, 2012; Eichengreen & Gupta, 2013; Lee & Hsieh, 2014). Previous research documents several reasons of less profitability of state-owned banks. First, governments are keen to pursue social goals for political purposes, such as providing credit to underserved sectors of the economy, reducing unemployment, or financing special infrastructure projects (La Porta et al., 1999; Pedersen & Thomsen 2003). Second, state-owned banks do not suffer from budget constraints therefore less likely to pursue strictly profit-maximizing strategies (Shleifer & Vishny, 1997; Dong et al. 2014). The combined effect of these factors results in lower loan quality, higher credit, and insolvency risk for government-owned banks than privately-owned ones (Barry et al., 2011).

Privately-owned banks however are dictated by the motives of increased profitability and shareholders' wealth maximization and are therefore incentivized to undertake more risk. Moreover, privately-owned banks are inclined to be more professional, customer focused and pursuing the goal of profit maximization. They are likely to hire professional and competent managers who provide in-depth competence, expertise, experience, and robust governance systems. Samet et al. (2018) conjecture that privately-owned banks exhibit higher risk-taking than state-owned banks because they pursue the objective of shareholders wealth maximization. However, privately-owned banks do not benefit from implicit guaranty in the event of default, which should propel them to be more risk-averse (Demirgüç-Kunt & Detragiache, 2002). Similarly, Duqi and Al-Tamimi (2018) show that private banks are inclined to be risk-averse as their investors are single owners or family groups who invest large share of their wealth. Privately-owned banks also remain deprived from stable deposit base as investors perceive privately-owned banks to be riskier in the times of crises.

Risk governance mechanisms are in place to provide risk oversight, risk management and risk mitigation functions, so that risks inherent in banking operations are within the bank risk appetite. The main difference in governance style of state-owned and privately-owned banks is that state-owned banks are guided by political motives rather than the goal of profit maximization, whereas privately-owned banks pursue the objective of profit and wealth maximization (García-Herrero et al., 2009). Therefore, the decision making in state-owned banks could be influenced by political incentives rather than professional and objective judgement. Risk governance structure may not achieve the intended goals of risk management and mitigation in state-owned banks as risk committee and chief risk officer would be unable to function objectively and independently in the presence of state ownership. Risk governance mechanisms in state-owned banks are used as symbolic gestures to establish legitimacy (Ames et al., 2018) rather than exercising substantial monitoring of managerial risk-taking. We therefore propose that the impact of risk governance mechanisms on risk-taking and performance is likely to vary across state-owned banks and privately-owned banks. Hence, the above discussion leads to the following hypothesis:

H3: The impact of risk governance mechanisms on risk-taking and performance is more pronounced in privately-owned banks than in state-owned banks.

3. Methodology

3.1. Data and sample

Since our research focuses on the impact of risk governance mechanisms in the post-global financial crisis, we choose our sample period from 2010 to 2017. The years 2007 and 2008 are regarded as subprime mortgage crisis period (Ryan, 2008; Erkens et al., 2012). In order to ensure that the pre-crisis period does not overlap with the post-financial crisis period, we select year 2010 instead of year

2009 to reduce the possibility of confounding effects. We only include listed commercial banks operating in the Asian region and exclude investment, savings, cooperative and mortgage banks to form a homogenous sample of banks with the common objective of profit maximization (Samet et al, 2018). We only keep banks for which data are available consistently for the whole time period, exclude countries where data are available for fewer than five banks, and discard subsidiaries of banks to avoid double counting, since the financial statements of the parent bank integrate the statements of its subsidiaries (Abedifar et al., 2013; Samet et al, 2018). Finally, both the state-owned and privately-owned banks must be operating in each country. After applying these filters, our final sample consists of 185 listed commercial banks in Asian region with 1480 firm year observations.

Table 1 and Fig. 1 presents the distribution of sample for countries with both state-owned and privately-owned banks. The consolidated financial data in US dollars are obtained from the Bank Scope database. The governance data are manually collected from the annual reports of banks available on their websites. Share price data are obtained from Yahoo Finance and trading websites. The country level macroeconomic and governance data are obtained from World Bank website and International risk guide (IRG).

3.2. Measurement of variables

3.2.1. Bank risk-taking

To investigate the impact of risk governance on bank risk-taking, we consider four different perspectives of risk namely credit risk, liquidity risk, operational risk, and insolvency risk. According to Basel Committee on Banking Supervision, these are the most relevant risks faced by commercial banks. Our first risk-taking proxy is credit risk (CR) which is related to the bank loan quality. Following Samet et al. (2018) and Safiullah and Shamsuddin (2018), credit risk is measured as the ratio of loan loss provisions to total gross loans. This ratio indicates the amount of the reserves maintained by banks to absorb credit losses. The higher the ratio, the greater the credit risk and vice versa.

Second, liquidity risk (LR) is measured as the ratio of total gross loans to total deposits. This ratio measures the extent to which banks use liquid deposits to finance illiquid loans. A large loan to-deposit ratio indicates a greater reliance on non-deposit funds to support lending growth and liquidity demand, which in turn implies higher liquidity risk (Acharya & Mora, 2015; DeYoung & Jang, 2016).

Third, we use natural logarithm of ZScore to measure insolvency risk, which is widely used in the literature (Laeven & Levine, 2009; Samet et al., 2018). Measured as (ROA + CAR)/σ(ROA), where ROA equals earnings before taxes and loan loss provisions divided by total assets and CAR (capital-asset ratio) equals equity divided by total assets, the ZScore can be interpreted as the number of standard deviations a bank's ROA must fall below its mean before equity is completely depleted and the bank is declared insolvent (Boyd et al., 2006). Therefore, higher ZScore indicates greater financial stability and lower insolvency risk, thus ZScore has an inverse relationship with the probability of bank failure. Finally, operational risk (OR) is measured by asset return volatility, following existing studies (John et al., 2008; Sun & Chang, 2011). We measure operational risk as the standard deviation of return on assets (ROA). A higher volatility of ROA is an indicator of higher operational risk.

3.2.2. Bank performance

Following prior literature (Battaglia & Gallo, 2015; Aljughaiman & Salama, 2019), we use Tobin's Q to measure the performance of banks. Tobin's Q is calculated as the market value of equity plus the book value of liabilities divided by book value of total assets.[4]

3.2.3. Risk governance variables

To examine the influence of risk governance on bank risk-taking, we include variables related to the presence and characteristics of risk committee (RC) and chief risk officer (CRO) that captures the strength and independence of risk governance function. We specifically use the following variables: (1) the presence of risk committee (RC) is a dummy variable coded 1, if the bank has a dedicated board-level risk committee and 0, otherwise; (2) risk committee size (*RC_Size*) is measured as the number of risk committee members; (3) risk committee meetings (*RC_Meetings*) is the number of risk committee meetings held in a financial year; (4) the presence of chief risk officer (CRO) is an indicator variable coded "1″ if CRO is present in a bank and 0, otherwise (5) CRO independence (CRO_Ind) is a dummy variable coded 1 if CRO is member of the executive board reporting directly to the board and "0" otherwise.

3.2.4. Control variables

In all our models, we control for several corporate governance, bank specific and country level variables. Among corporate governance variables, we control for the board size (*BOARD_SIZE*), the proportion of independent directors on the board (*BOARD_IND*) and CEO role duality (*DUAL*). Previous literature (Abedifar et al., 2013; Sun & Liu, 2014; Luu, 2015; Mollah et al., 2017) suggests that board composition and CEO role duality may affect a firm's risk taking. However, the direction of the relationship is not consistent in the literature. Further, we control for the ownership structure characteristics, such as ownership concentration (*CON_OWN*) and institutional ownership (*INST_OWN*). Institutional ownership is measured as the proportion of shares held by institutional investors, while ownership concentration is the proportion of shares held by five largest shareholders of the bank. Institutional ownership might play a monitoring and disciplining role to provide risk oversight functions in banks. Similarly, a higher ownership concentration may motivate the shareholders to monitor managers and limit their risk taking (Shehzad et al., 2010). Counterintuitively, a higher

[4] We only consider market performance of banks as accounting performance is subject to earnings management and this behavior is pervasive in Asian banks (Wu et al., 2016).

Table 1
Sample distribution.

	No of Banks			Percentage of Banks			No of Observations			Percentage of Observations		
Countries	**Full Sample**	**SOBs**	**POBs**	**Full Sample**	**SOBs**	**POBs**	**SOBs**	**POBs**	**Full Sample**	**SOBs**	**POBs**	**Full Sample**
Bangladesh	29	1	28	15.7%	1.8%	23.9%	8	224	232	1.5%	23.9%	15.7%
China	21	15	6	11.3%	22.0%	5.2%	120	48	168	22%	5.10%	11.35%
India	32	19	13	17.3%	27.9%	11.2%	152	104	256	27.9%	11.1%	17.3%
Japan	12	4	8	6.5%	5.9%	6.9%	32	64	96	5.8%	6.8%	6.35%
Malaysia	9	3	6	4.9%	4.4%	5.2%	24	48	72	4.4%	5.1%	4.9%
Pakistan	18	3	15	9.7%	4.4%	12.9%	24	120	144	4.4%	12.8%	9.7%
Saudi Arabia	10	3	7	5.4%	4.4%	5.9%	24	56	80	4.4%	6.1%	5.4%
South Korea	9	3	6	4.9%	4.4%	5.2%	24	48	72	4.4%	5.1%	4.9%
Sri Lanka	9	2	7	4.9%	2.9%	5.9%	16	56	72	2.9%	6%	4.9%
Thailand	14	7	7	7.5%	10.2%	5.9%	56	56	112	10.3%	6%	7.6%
Turkey	10	3	7	5.4%	4.4%	5.9%	24	56	80	4.4%	6%	5.4%
UAE	12	5	7	6.5%	7.3%	5.9%	40	56	96	7.6%	6%	6.5%
Total	**185**	**68**	**117**	**100%**	**100%**	**100%**	**544**	**936**	**1480**	**100%**	**100%**	**100%**

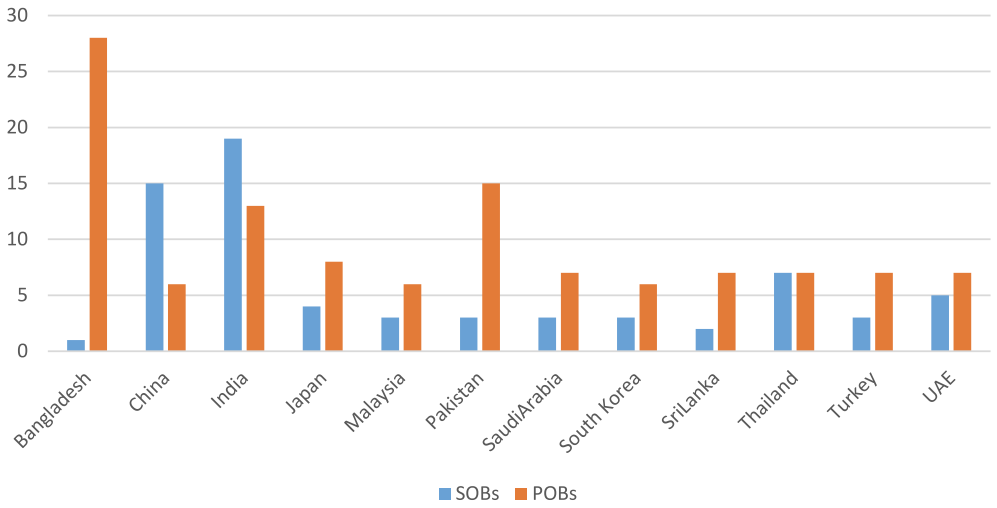

Fig. 1. Sample Distribution. This figure depicts the distribution of the comprehensive sample of privately owned banks (POBs) and state-owned banks (SOBs) across the sample of Asian countries.

ownership concentration and institutional ownership may see them engaging in higher risk taking to maximize their wealth.

Bank specific variables also play a vital role in determining bank risk-taking. Following prior studies (Sun & Liu, 2014; Mollah et al., 2017; Aljughaiman & Salama, 2019), we control for bank size (*BANK_SIZE*), income diversification (*INC_DIV*) and deposit ratio (*DEP*). *BANK_SIZE* is measured as the natural logarithm of total assets. Small banks are likely to be more conservative in risk-taking because of limited access to external funds. Large banks are more prone to higher risk-taking owing to their advantage of 'too big to fail' reputation, which provide them incentives to take more risk (Aljughaiman & Salama, 2019). *INC_DIV* is the ratio of non-interest income to total operating income, while *DEP* is the ratio of total deposit to total assets. Keeley (1990) argue that a higher deposit ratio reduces risk taking incentives; therefore, we expect a negative relationship of deposit ratio with risk-taking. Banks that are inclined to generate more non-interest income might lose their focus on credit activities. DeYoung and Roland (2001) argue that the volatility of banks portfolio increases if banks rely on non-interest income. Similarly, insolvency risks might increase if the reliance is more on non-interest income. Therefore, we expect a positive relationship between income diversification and bank risk-taking.

Finally, we use country-specific variables to control for differences in economic development, growth, and governance quality. These variables are: (1) *GDP* measured as the natural logarithm of real *GDP* in US dollars; (2) *GPS*, the ratio of gross private savings to GDP; and (3) *LAW_INDEX*, an index for the effectiveness of legal system and investors' rights protection.

3.3. Estimation models

We use the GLS random-effects estimator, which has been employed in previous studies on bank risk and governance (Abedifar et al., 2013; Mollah & Zaman, 2015; Safiullah & Shamsuddin, 2018). A random-effects model is preferable over a fixed-effects model, because fixed-effects model requires time variation and cross-firm variation of variables. Indeed, the bank-level governance variables do not considerably vary over time and the country-level variables have no variation across banks. This model specification is also

more appropriate given the presence of several dummy variables in our empirical models, as the fixed-effects model wipes out the effects of individual dummy variables (Baltagi, 2008; Wooldridge, 2010). We perform subsample analysis based on SOBs and POBs to examine whether the association between risk governance variables and bank risk-taking is subject to ownership status of banks. Furthermore, all models are re-estimated using GMM (Generalized Methods of Moments) approach to control for any potential endogeneity and to ensure the robustness of our results.

The hypotheses H1a to H1e are tested using the bank risk-taking equation as follows:

$$Risk_{i,j,t} = \alpha_0 + \alpha_1 RC_{i,j,t} + \alpha_2 RC\_Size_{i,j,t} + \alpha_3 RC\_Meetings_{i,j,t} + \alpha_4 CRO_{i,j,t} + \alpha_5 CRO\_Ind_{i,j,t} + \alpha_6 COR\_GOV_{i,j,t} + \alpha_7 Controls_{i,j,t} + \varepsilon_{i,j,t} \quad (1)$$

The impact of risk governance mechanisms on bank performance (hypothesis H2) is examined via Equation (2) below:

$$Tobin's Q_{i,j,t} = \alpha_0 + \alpha_1 RC_{i,j,t} + \alpha_2 RC\_Size_{i,j,t} + \alpha_3 RC\_Meetings_{i,j,t} + \alpha_4 CRO_{i,j,t} + \alpha_5 CRO\_Ind_{i,j,t} + \alpha_6 COR\_GOV_{i,j,t} + \alpha_7 Controls_{i,j,t} + \varepsilon_{i,j,t} \quad (2)$$

where $Risk_{i,j,t}$ is the proxy of either credit, liquidity, insolvency or operational risk for bank i in country j at time t; $TobinQ_{i,j,t}$ is the performance of bank i in country j at time t; $RC_{i,j,t}$ is the dummy variable for risk committee; $RCSize_{i,j,t}$ is the size of risk committee; $RC\_Meetings_{i,j,t}$ is the number of risk committee meetings; $CRO_{i,j,t}$ is the indicator variable for chief risk officer presence; and $CRO\_Ind_{i,j,t}$ is the indicator variable for the CRO independence. $COR\_GOV_{i,j,t}$ and $Controls_{i,j,t}$ are vectors of corporate governance and control variables, respectively. $\varepsilon_{i,j,t}$ is the error term. The detailed definition and measurement of the variables are provided in appendix.

Table 2
Preliminary analysis.

Panel A. Descriptive statistics

	Full Sample					SOBs Sample	POBs Sample	
Variable	**Mean**	**Median**	**SD**	**Min**	**Max**	**Mean**	**Mean**	**Two sample T-Test**
CR	0.050	0.014	0.193	0	2.971	0.033	0.061	2.697***
LR	0.861	0.8	0.731	0	3.178	0.959	0.803	−3.981***
ZScore	3.155	3.259	0.956	−2.145	6.054	3.242	3.104	−2.650***
OR	0.027	0.004	0.212	0.007	2.885	0.050	0.014	−3.201***
Tobin's Q	1.147	1.102	0.235	0.323	2.147	1.023	1.025	0.496
RC	0.854	1	0.354	0	1	0.897	0.827	−3.647***
RC_Size	4.326	4	2.529	0	14	5.077	3.886	−8.965***
RC_Meetings	4.617	4	3.747	0	37	5.141	4.301	−4.180***
CRO	0.877	1	0.328	0	1	0.918	0.854	−3.623***
CRO_Ind	0.611	1	0.487	0	1	0.578	0.665	3.325***
BOARD_SIZE	11.265	11	3.482	3	31	11.089	11.368	1.487
BOARD_IND	0.354	0.353	0.203	0	1	0.331	0.367	3.329***
DUAL	0.161	0	0.368	0	1	0.342	0.054	−15.657***
CON_OWN	0.621	0.643	0.230	0.034	0.999	0.738	0.552	−16.346***
INST_OWN	0.647	0.697	0.258	0.049	0.999	0.796	0.559	−18.887***
BANK_SIZE	16.876	16.994	2.137	11.629	22.109	17.779	16.345	−13.149***
INC_DIV	0.408	0.273	0.529	0.053	0.823	0.253	0.499	8.822***
DEP	0.714	0.742	0.165	0.041	1.795	0.724	0.709	−1.729
GDP	20.446	20.277	1.417	17.858	23.208	–	–	–
GPS	0.308	0.308	0.123	0.068	0.574	–	–	–
LAW_INDEX	0.594	0.580	0.165	0.330	0.830	–	–	–

Panel B. Univariate comparison of risk committee and CRO presence

	Risk Committee Existence			CRO Existence		
Variable	**Yes**	**No**	**Two Sample T-Test**	**Yes**	**No**	**Two sample T-Test**
CR	0.046	0.078	2.503***	0.046	0.084	2.496***
LR	0.828	1.052	4.186***	0.866	0.823	−0.742
ZScore	3.165	3.097	−0.955	3.186	2.929	−3.363***
OR	0.025	0.039	0.940	0.024	0.043	1.103
Tobin's Q	1.005	0.887	−3.253***	1.010	0.923	−2.134**
BOARD_SIZE	11.158	11.888	2.855**	11.325	10.839	−1.757*
BOARD_IND	0.364	0.293	−4.800***	0.368	0.249	−7.493***
DUAL	0.178	0.060	−4.400***	0.169	0.104	−2.199**
CON_OWN	0.618	0.634	0.951	0.625	0.593	−1.730*
INST_OWN	0.649	0.635	−0.704	0.654	0.598	−2.731***
BANK_SIZE	16.828	17.146	2.021**	16.927	16.508	−2.472**
INC_DIV	0.393	0.495	2.611***	0.411	0.383	−0.673
DEP	0.729	0.624	−8.825***	0.718	0.682	−2.730**

All variables are as defined in Appendix. We also report on the paired sample mean test (*t*-test). *p < 0.1; **p < 0.05; ***p < 0.01 (two-tailed test).

4. Empirical results

4.1. Univariate analysis

Panel A of Table 2 report the descriptive statistics for all variables considered. We also present the mean values of all the variables for subsample of SOBs and POBs. These results reveal that POBs have higher credit and insolvency risk but lower liquidity and operational risk than SOBs. Concerning credit risk, the mean loan loss reserve ratio for whole sample is 5%. POBs and SOBs have on average loan loss reserve ratio of 6.1% and 3.3%, respectively and the difference is statistically significant at 1% level, implying that POBs have higher credit risk. The mean loan to deposit ratio (proxy for liquidity risk) is 80% for POBs and 95% for SOBs, with an average ratio of 86% for full sample. The difference is statistically significant at 1% level, implying a higher liquidity risk for SOBs. The mean value for ZScore (our measure of insolvency risk) is 3.242 for SOBs and 3.104 for POBs, indicating a higher insolvency risk for private banks. The difference of means is significant at 1% level. Asset return volatility is used as a proxy for operational risk. The mean of asset return volatility is 0.050 for state owned banks and 0.014 for private banks, implying a higher operational risk for state owned banks and difference is significant at 1% level. Average Tobin's Q is 1.147 for full sample, 1.023 for SOBs and 1.025 for POBs, respectively. There is no significant difference between the two sub-samples for Tobin's Q.

The mean value of RC is 0.854 for full sample, which suggests that 85% of the banks have a dedicated board level risk committee. The average risk committee size is 4.326 for full sample, 5.077 for SOBs and 3.886 for POBs. The average number of risk committee meetings is 4.617 for full sample, 5.141 for SOBs and 4.301 for POBs. The CRO is present and assigned the responsibility of risk management in 87% banks for full sample. Concerning subsamples, the CRO function is more pronounced in SOBs with mean value of 0.918 than POBs mean value of 0.854. However, CROs are more independent in POBs with mean value of 0.665 as compared to 0.578 for SOBs, suggesting that POBs place greater emphasis on independent functioning of CRO. The mean difference for risk governance variables is statistically significant at 1% level for the subsample of POBs and SOBs. The descriptive statistics provide a complete picture of our bank sample by considering other governance and financial characteristics. The *t*-test shows significant differences between SOBs and POBs mean values for board independence (*BOARD_IND*), CEO duality (*DUAL*), ownership concentration (*CON_OWN*) and institutional ownership (*INST_OWN*). The mean value for *BOARD_IND* is 0.331 for SOBs and 0.367 for POBs, suggesting greater board independence in POBs. CEO role duality is more pronounced in SOBs sample with a mean value of 0.342 as compared to mean value of 0.054 in POBs. SOBs also have higher ownership concentration and institutional ownership as compared to POBs. As to bank specific variables, SOBs are larger in size and have higher deposit ratio and less non-interest income than POBs.

Panel B of Table 2 and Fig. 2 present the differences among banks with and without the existence of risk committee and CRO position. The results suggest that banks with risk committee have lower credit, liquidity, insolvency, and operational risk as compared to banks without a dedicated board-level risk committee. The mean differences are also statistically significant for credit and liquidity risk. Tobin's Q is significantly higher for banks with risk committee. Banks with CRO have lower credit, insolvency and operational risk compared to banks without CRO. Banks with CRO have higher Tobin's Q than banks without CRO and the difference is statistically significant at 5% level. Banks with CRO are larger in size, have large boards, higher institutional ownership, higher board independence and duality, and have higher deposits and non-interest income.

Table 3 presents the Pearson's pairwise correlation matrix for all the variables. The correlation among all variables is$<$0.5, suggesting the absence of high correlation among variables. The un-tabulated results of the variance inflation factor (VIF) show that VI factors of all variables are also within allowed limits. So, our sample does not suffer from multicollinearity issues that could influence our results.

4.2. Multivariate analysis

4.2.1. Test of hypotheses

Table 4 presents the regression results for the relationship between risk governance mechanisms, four different perspectives of risk,

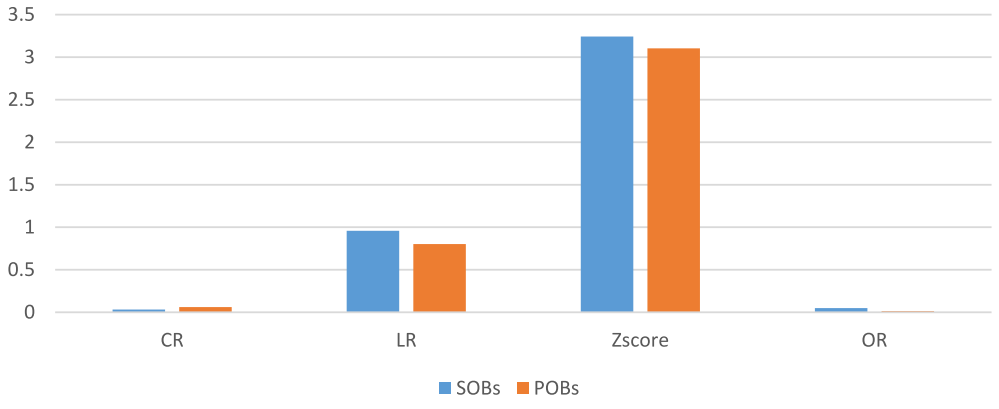

Fig. 2. Mean differences in risk proxies by state owned banks (SOBs) and privately owned banks (POBs) sample.

Table 3
Pearson pairwise correlation matrix for full sample.

Variables	1	2	3	4	5	6	7	8	9	10
1. *CR*	1.000									
2. *LR*	−0.102*	1.000								
3. *ZScore*	−0.059	−0.018	1.000							
4. *OR*	−0.013	0.006	−0.088*	1.000						
5. *Tobin Q*	−0.010	0.101*	0.008	−0.007	1.000					
6. *RC*	−0.053	−0.108*	0.040	−0.024	−0.172*	1.000				
7. *RC_Size*	−0.089*	−0.038	−0.007	−0.071*	−0.117*	0.308*	1.000			
8. *RC_Meetings*	−0.057	0.001	0.022	−0.024	−0.083	0.409*	0.395*	1.000		
9. *CRO*	−0.065*	−0.019	0.093*	−0.028	−0.186*	0.482*	0.452*	0.316*	1.000	
10. *CRO_Ind*	−0.055*	−0.022	0.078*	−0.019	−0.012*	0.492*	0.387*	0.292*	0.492*	1.000
11. *BOARD_SIZE*	−0.064	−0.032	−0.086*	−0.061	0.135*	−0.074	0.052	0.007	0.045	0.036
12. *BOARD_IND*	−0.049	−0.085*	0.147*	0.029	−0.086	0.124*	0.091*	0.098*	0.192*	0.175*
13. *DUAL*	−0.034	−0.020	−0.018	−0.020	−0.028	0.114*	0.220*	−0.025	0.220*	0.192*
14. *CON_OWN*	0.007	0.043	0.098*	0.055	0.061	−0.025	0.137*	−0.055	0.045	0.053
15. *INST_OWN*	−0.045	0.054	0.119*	0.045	0.046	0.018	0.223*	0.007	0.071	0.069
16. *BANK_SIZE*	−0.033	−0.086*	0.177*	−0.047	0.078	−0.052	0.083*	0.070	0.064	0.032
17. *INC_DIV*	−0.039	0.065	0.142*	0.011	−0.043	−0.067	−0.085*	0.011	0.017	0.021
18. *DEP*	−0.073	−0.374*	0.033	0.023	−0.040	0.224*	0.203*	0.035	0.071	0.056
19. *GDP*	−0.017	−0.074	0.152*	−0.073*	0.087*	−0.022	0.068	−0.103*	0.149*	0.112*
20. *GPS*	0.074	0.036	0.308*	0.004	−0.044	0.308*	0.135*	0.123*	0.216*	0.231*
21. *LAW_INDEX*	−0.028	−0.080*	0.325*	0.001	0.096*	−0.049	−0.041	−0.105*	0.070	0.065

	11	12	13	14	15	16	17	18	19	20	21
11. *BOARD_SIZE*	1.000										
12. *BOARD_IND*	−0.162*	1.000									
13. *DUAL*	−0.123*	0.115*	1.000								
14. *CON_OWN*	−0.057	−0.015	0.273*	1.000							
15. *INST_OWN*	−0.086*	0.144*	0.291*	0.821*	1.000						
16. *BANK_SIZE*	0.208*	0.163*	0.221*	0.236*	0.328*	1.000					
17. *INC_DIV*	0.052	−0.087*	−0.071	−0.068	−0.139*	−0.102*	1.000				
18. *DEP*	−0.049	0.047*	0.143*	0.018	−0.028	−0.225*	−0.009	1.000			
19. *GDP*	0.215	0.158*	0.213*	0.271*	0.359*	0.723*	−0.140*	−0.137*	1.000		
20. *GPS*	0.074	0.142*	0.043	0.050	0.122*	0.407*	−0.061	−0.076	0.470*	1.000	
21. *LAW_INDEX*	−0.216*	0.363*	0.340*	0.298*	0.356*	0.467*	−0.134*	−0.081	0.462*	0.347*	1.000

All variables are as defined in Appendix and *p < 0.1.

and financial performance of Asian banks. Columns (1) to (5) show the results of GLS random-effects estimations for the relationship between risk governance mechanisms, bank risk-taking and performance for the full sample. As proposed in H1a, the presence of risk committee (*RC*) is negatively associated with credit risk (*CR*), liquidity risk (*LR*) and operational risk (*OR*). The relationship is statistically significant at 1% level for *CR* and *LR*, but weakly significant at 10% level for *OR*. This result is in line with the findings of existing studies (Aljughaiman & Salama, 2019; Malik et al., 2021) and suggests that risk committees improve governance quality and lower bank risk-taking.

In line with H1b, the size of risk committee (*RC_Size*) is negatively related with operational risk (*OR*), credit risk (*CR*) and liquidity risk (*LR*). The relationship is statistically significant at 1% level for *CR* and *OR*, but weakly significant at 10% level for *LR*. However, no significant association is observed for ZScore. These findings are consistent with existing corporate governance literature that larger boards and risk committees are associated with improved transparency and stronger risk governance (Aebi et al., 2012; Hines et al., 2015).

Aligned with H1c, the number of risk committee meetings (*RC_Meetings*) has a significant and negative relationship with credit (*CR*) and operational risk (*OR*) but a significant and positive association is observed with ZScore (our inverse proxy of insolvency risk). Finally, the relationship between *RC_Meetings* and liquidity risk (*LR*) is negative but statistically insignificant. As suggested by Adams and Ferreira (2007) for board meetings, our findings highlight that more frequent risk committee meetings are an effective mechanism to oversee risk-taking behavior of commercial banks as well as to reduce the level of risk-taking.

For H1d, we find that the presence of chief risk officer (*CRO*) is negatively associated with liquidity risk (*LR*) and operational risk (*OR*). However, the presence of *CRO* is not associated with other measures of risk. These findings provide partial support to H1d by showing that the presence of CRO is likely to reduce particular type of risks.

As proposed in H1e, the independence of CRO from management (*CRO_Ind*) is instrumental in reducing credit risk (*CR*), liquidity risk (*LR*) and operational risk (*OR*) as evidenced by the negative and significant coefficient on *CR*, *LR* and *OR*. In line with the arguments of agency theory, these results suggest that *CRO_Ind* improves the monitoring function by taking unbiased and efficient decisions resulting in strong risk oversight and effective risk mitigation.

With regard to H2, results reported in Column (5) of Table 4 show that none of the risk governance mechanisms has significant relationship with financial performance measured by Tobin's Q, suggesting that risk governance mechanisms do not have any influence on financial performance of commercial banks. We therefore reject H2.

Table 4
Regression results for the link between risk governance mechanisms, bank risk-taking and performance

Variables	(1)	(2)	(3)	(4)	(5)
	CR	**LR**	**ZScore**	**OR**	**Tobin's Q**
RC	−0.082***	−0.595***	0.172***	−0.045*	−0.443
	(-2.65)	(-7.00)	(2.55)	(-1.75)	(-0.17)
RC_Size	−0.006**	−0.014*	−0.009	−0.009***	−0.039
	(-1.96)	(-1.71)	(-1.43)	(-2.80)	(-0.15)
RC_Meetings	−0.008***	−0.001	0.042***	−0.003**	0.033
	(-4.07)	(-0.14)	(3.09)	(-1.94)	(0.20)
CRO	−0.004	−0.528***	0.070	−0.006*	−1.52
	(-0.04)	(-6.70)	(1.11)	(-1.80)	(-0.62)
CRO_Ind	−0.021***	−0.062***	1.801	−0.120***	−1.41
	(-2.83)	(-3.66)	(0.33)	(-3.06)	(-0.59)
BOARD_SIZE	−0.001	−0.014***	−0.001	−0.001	−0.072
	(-0.10)	(-2.38)	(-0.03)	(-0.57)	(-0.39)
BOARD_IND	0.061**	−0.051	0.161***	0.045	−1.488
	(1.91)	(-0.60)	(2.44)	(1.47)	(-0.55)
DUAL	−0.017	0.051	0.011	−0.012	−0.810
	(-0.74)	(0.78)	(0.21)	(-0.74)	(-0.41)
CON_OWN	0.097*	−0.002	−0.246*	0.051	0.389
	(1.64)	(-0.02)	(-1.83)	(1.17)	(0.08)
INST_OWN	−0.119***	0.101	0.515***	0.053	−0.865
	(-2.18)	(0.65)	(4.08)	(1.29)	(-0.19)
BANK_SIZE	0.004	−0.083***	0.280***	0.003	−0.218
	(0.59)	(-3.36)	(11.47)	(0.72)	(-0.41)
INC_DIV	−0.018	0.054*	−0.064***	0.003	−0.200
	(-1.52)	(1.76)	(-2.39)	(0.29)	(-0.18)
DEP	−0.086***	−1.115***	0.578***	0.031	0.732
	(-2.17)	(-10.28)	(6.70)	(0.87)	(0.21)
GDP	−0.004	0.032	0.359***	−0.022***	1.019
	(-0.35)	(0.81)	(8.92)	(-3.40)	(0.98)
GPS	0.095	−0.096	−0.528***	0.122**	−6.688
	(1.22)	(-0.42)	(-2.75)	(2.32)	(-1.01)
LAW_INDEX	−0.049	0.044	0.153	−0.018	5.753
	(-0.71)	(0.22)	(0.89)	(-0.35)	(0.96)
Intercept	0.125	2.476***	0.093	0.337***	−13.251
Year Effects	Yes	Yes	Yes	Yes	Yes
Country Effects	Yes	Yes	Yes	Yes	Yes
Overall R^2	0.22	0.15	0.20	0.15	0.14
Number of observations	1480	1475	1459	1475	1401
Wald Chi^2	41.07***	188.24***	322.68***	52.17***	38.65***

This table presents GLS random effect estimation results for risk governance mechanisms, bank risk-taking and performance for full sample. All variables are as defined in Appendix.
Z-statistics in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.

Table 5 contains the results of GLS random-effects estimations for the subsample of state-owned banks (SOBs) and privately-owned banks (POBs). For SOBs sample, our results demonstrate that the presence (*RC*) and size of risk committee (*RC_Size*) reduces liquidity (*LR*) and credit risk (*CR*), respectively but do not have any association with other measures of risk. The frequency of risk committee meetings (*RC_Meetings*), the presence (*CRO*) and the independence of chief risk officer (*CRO_Ind*) are not associated with any measure of risk, except credit risk (*CR*) which is negatively associated with these risk governance mechanisms. Finally, the relationship between risk governance mechanisms and financial performance is also insignificant in the SOBs sample.

For POBs sample, the results reported in Column (6) suggest that the mere presence of risk committee and chief risk officer is not enough for reducing credit risk. However, characteristics of risk committee (*RC_Size & RC_Meetings*) and chief risk officer (*CRO_Ind*) are effective governance mechanisms for reducing credit risk (*CR*). The results reported in Column (7) show that all governance mechanisms are effective at reducing liquidity risk (*LR*). Column (8) presents the results of the relationship between risk governance mechanisms and insolvency risk (*ZScore*). The risk governance mechanisms do not have any significant relationship with *ZScore*, except risk committee size (*RC_Size*). The risk committee size (*RC_Size*) is positively associated with *ZScore*, suggesting that larger risk committees reduce insolvency risk. For operational risk (*OR*), the results reported in Colum (9) show that all risk governance mechanisms are negatively and significantly associated with *OR*, except risk committee meeting *(RC_Meetings*). The results in Column (10) show that all risk governance mechanisms are positively and significantly associated with financial performance (*Tobin's Q*), except risk committee size *(RC_Size*).

Taken together, the findings of subsample analysis indicate that the quality of risk governance mechanisms varies significantly across SOBs and POBs. In particular, risk governance mechanisms are more effective at reducing risk and improving financial performance in POBs than in SOBs. We therefore accept H3. These findings may be attributed to the notion that risk committees and chief risk officers of SOBs do not practice substantial independence and objectivity in risk oversight functions because SOBs may be

Table 5
Regression results for the association between risk governance mechanisms, bank risk-taking and performance.

Variables	SOBs Sample					POBs Sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	CR	**LR**	**Z-Score**	**OR**	**Tobin's Q**	**CR**	**LR**	**ZScore**	**OR**	**Tobin's Q**
RC	0.020	−1.278***	0.296	−0.524	−5.052	0.133	−0.172***	−0.089	−0.037***	0.067***
	(1.34)	(-6.56)	(1.47)	(-1.31)	(-0.61)	(1.35)	(-3.30)	(-1.03)	(-2.80)	(2.42)
RC_Size	−0.002**	0.010	0.009	0.025	−0.500	−0.015***	−0.014***	0.020**	−0.002**	0.001
	(-2.21)	(0.53)	(0.82)	(1.59)	(-0.68)	(-4.25)	(-2.74)	(2.57)	(-1.98)	(0.64)
RC_Meetings	−0.001*	−0.029	0.007	−0.000	0.090	−0.010**	−0.026***	0.006	0.002	0.001*
	(-1.86)	(-0.66)	(1.09)	(-0.07)	(0.23)	(-2.06)	(-6.96)	(1.05)	(0.98)	(1.79)
CRO	−0.049***	−0.025	0.058	−0.037	−0.012	0.044	−1.201***	0.033	−0.870***	16.845**
	(-3.13)	(-0.53)	(0.72)	(-0.37)	(-0.52)	(1.16)	(-6.13)	(0.30)	(-5.47)	(2.05)
CRO_Ind	−0.024***	−0.039	0.042	−0.029	−0.022	−0.051***	−1.335***	0.042	−0.928***	17.121***
	(-2.74)	(0.61)	(0.58)	(-0.22)	(-0.71)	(-2.99)	(-6.50)	(0.44)	(-6.150	(2.55)
BOARD_SIZE	−0.000	−0.015	−0.004	−0.011	0.542	0.008	−0.005	−0.000	−0.000	−0.001
	(-0.03)	(-1.15)	(-0.62)	(-1.06)	(0.96)	(0.65)	(-1.45)	(-0.01)	(-0.24)	(-0.65)
BOARD_IND	0.007	−0.180	−0.016	−0.012	−5.660	0.079	0.027	0.229***	0.021*	−0.011
	(0.44)	(-0.88)	(-0.14)	(-0.07)	(-0.71)	(1.57)	(0.52)	(2.88)	(1.68)	(-0.35)
DUAL	−0.007	0.008	0.038	0.143	−3.350	−0.044	0.014	−0.023	0.002	−0.002
	(-0.93)	(0.08)	(0.57)	(1.49)	(-0.88)	(-0.73)	(0.22)	(-0.21)	(0.13)	(-0.06)
CON_OWN	0.007	0.220	−0.317	0.463	2.368	0.050	−0.010	−0.228	−0.073***	−0.008
	(0.15)	(0.32)	(-0.74)	(0.76)	(0.11)	(0.61)	(-0.12)	(-1.56)	(-3.21)	(-0.17)
INST_OWN	0.043	−0.120	0.652	−0.580	−8.094	−0.093	0.052	0.446***	0.044**	−0.034
	(0.75)	(-0.15)	(1.39)	(-0.87)	(-0.31)	(-1.25)	(0.64)	(3.32)	(2.44)	(-0.81)
BANK_SIZE	0.000	−0.106*	−0.352***	0.023	−0.221	0.008	−0.041***	−0.263***	−0.013***	−0.011*
	(0.02)	(-1.85)	(-7.91)	(0.78)	(-0.15)	(0.65)	(-2.82)	(-8.85)	(-3.27)	(1.08)
INC_DIV	−0.017**	0.208**	−0.051	−0.100	−1.584	−0.016	0.013	−0.058**	0.002	0.010
	(-2.54)	(2.49)	(-0.61)	(-1.52)	(-0.21)	(-0.97)	(0.75)	(-2.11)	(0.64)	(1.00)
DEP	−0.001	−1.634***	0.515***	0.021	0.412	−0.156**	−0.570***	0.643***	0.010	0.029
	(-0.07)	(-6.97)	(3.71)	(0.11)	(0.04)	(-2.28)	(-8.06)	(2.58)	(0.60)	(0.70)
GDP	−0.003	−0.020	0.521***	−0.028	2.234	−0.006	0.010	0.295***	−0.002	0.014
	(-0.62)	(-0.23)	(7.29)	(-0.29)	(0.92)	(-0.36)	(0.44)	(5.84)	(-0.44)	(1.45)
GPS	0.006	−0.121	0.053	0.225	−39.279**	0.171	−0.077	−0.821***	−0.066**	−0.153**
	(0.15)	(-0.21)	(0.15)	(0.44)	(-2.17)	(1.41)	(-0.58)	(-3.60)	(-1.93)	(-2.26)
LAW_INDEX	0.022	−0.088	−0.779**	0.187	29.680*	−0.129	0.058	0.648***	−0.017	0.121*
	(0.60)	(-0.17)	(-2.48)	(0.42)	(1.66)	(-1.16)	(0.48)	(3.10)	(-0.56)	(1.88)
Intercept	0.088	4.825***	−1.467	1.519	−19.528	0.205	1.678***	0.793	0.381	0.972***
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Overall R^2	0.20	0.30	0.18	0.16	0.34	0.22	0.25	0.13	0.14	0.27
Number of Obs.	545	545	537	545	479	929	930	922	930	922
Wald Chi^2	52.27***	153.07***	122.87***	100.56***	34.62***	81.47***	133.89***	251.45***	78.15***	37.41***

This table presents GLS random effect estimation results for risk governance mechanisms, bank risk-taking and market performance for SOBs and POBs sample.
All variables are as defined in Appendix. Z-statistics in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.

motivated by the political incentives rather than purely economic motives (Duqi & Al-Tamimi, 2018) or keen to follow social goals for political purposes due to soft budget constraints (Dong et al., 2014), which is likely to cause reduced credit quality and higher default risk for SOBs (Barry et al., 2011).

4.2.2. Addressing endogeneity

We acknowledge that our estimated coefficients for the relationship between risk governance mechanisms, bank risk-taking and performance might be subject to potential endogeneity problem. We address this issue as suggested by Blundell and Bond (1998), by using the two-step system GMM approach to examine the relationship between risk governance mechanisms, bank risk-taking and performance. The system GMM provides more reliable results by controlling for simultaneity and omitted variable biases (Wintoki et al., 2012; Gull et al., 2018; Aljughaiman & Salama, 2019; Nekhili et al., 2020; Shahab et al., 2021). The use of the system GMM estimation approach needs to be justified by testing autocorrelation to detect dynamic specifications of the endogenous and dependent variables. To do so, we rely on the Wooldridge (2002) test, which strongly rejects the null hypothesis of no autocorrelation. The validity tests confirm that our GMM estimators are valid. The first-order serial correlation AR(1) shows a significant result (p-value < 1%) across all our models, thus rejecting the null hypothesis of no first-order serial correlation and confirming that the residuals in the

Table 6
GMM estimations for the association between risk governance, bank risk taking and performance.

Variables	(1)	(2)	(3)	(4)	(5)
	CR	**LR**	**ZScore**	**OR**	**Tobin Q**
Dependent Variable$_{(t-1)}$	0.827***	0.835***	0.984***	0.803***	0.932***
	(313.67)	(189.77)	(97.64)	(612.66)	(316.97)
RC	−0.064***	−1.211***	0.078	−0.010	0.039
	(-11.35)	(-35.02)	(0.96)	(1.23)	(1.05)
RC_Size	−0.003***	−0.013	−0.001	−0.003***	0.012
	(-7.24)	(1.34)	(-0.21)	(-3.59)	(0.71)
RC_Meetings	−0.010***	−0.006***	0.019***	−0.005***	0.003***
	(-6.25)	(-4.78)	(7.28)	(-2.49)	(2.52)
CRO	0.009	−0.860***	0.551	−0.048***	0.017
	(1.06)	(-14.42)	(1.56)	(-3.25)	(0.582)
CRO_Ind	0.010	−0.912***	0.661***	−0.052***	0.022
	(1.09)	(-15.178)	(8.29)	(-4.18)	(0.684)
BOARD_SIZE	−0.004	−0.011***	0.014***	−0.002***	−0.026***
	(-1.25)	(-3.61)	(2.50)	(-3.36)	(-6.54)
BOARD_IND	0.001	−0.023	0.131**	0.035***	−0.141***
	(0.28)	(-0.77)	(2.08)	(4.20)	(-3.91)
DUAL	−0.006**	0.090***	−0.251***	0.039***	−0.078***
	(-2.24)	(4.71)	(-5.56)	(4.37)	(-5.35)
CON_OWN	0.040***	−0.141***	0.088	0.014	−0.029
	(5.05)	(-2.78)	(0.65)	(1.06)	(-0.55)
INST_OWN	−0.032***	−0.014	0.301**	−0.023*	−0.248***
	(-3.54)	(-0.39)	(2.06)	(-1.88)	(-5.30)
BANK_SIZE	0.004	−0.001	0.059***	−0.001	0.014***
	(0.49)	(-0.25)	(2.61)	(-0.45)	(2.31)
INC_DIV	−0.001	−0.042***	0.094***	−0.009**	0.004
	(-0.56)	(-2.63)	(2.78)	(-2.29)	(0.37)
DEP	−0.008	−0.129***	1.005***	−0.019***	−0.162***
	(-0.82)	(-2.43)	(7.45)	(-2.72)	(-3.53)
GDP	0.001	−0.004	−0.096***	0.003	0.065***
	(0.95)	(-0.48)	(-3.02)	(0.17)	(6.20)
GPS	0.011	0.070	2.070***	0.004	−0.721***
	(1.35)	(0.99)	(10.19)	(0.29)	(-6.46)
LAW_INDEX	−0.026***	−0.300***	1.479***	−0.076***	0.003
	(-3.25)	(-4.43)	(8.44)	(-4.59)	(0.949)
Intercept	−0.050**	0.938***	1.940***	0.054**	−0.761***
Country Effects	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes
Number of observations	1288	1290	1276	1290	1225
F (Prob > F)	9488.69***	1523.7***	790.49***	2859.63***	1718.64***
Arellano–Bond test AR(1) (z, *p*–value):	−5.32($p = 0.000$)	−4.52($p = 0.000$)	−3.79($p = 0.000$)	−4.58(p = 0.000)	−4.28($p = 0.000$)
Arellano–Bond test AR(2) (z, *p*–value):	−0.87($p = 0.38$)	−0.90($p = 0.37$)	0.62($p = 0.53$)	−1.02($p = 0.30$)	−1.00($p = 0.31$)
Sargan test (Chi–square, *p*–value):	185.30($p = 0.000$)	844.75($p = 0.000$)	2015.75($p = 0.000$)	338.42($p = 0.000$)	3823.77($p = 0.000$)
Hansen test (Chi–square, *p*–value):	90.92($p = 0.974$)	99.42(p = 0.904)	107.18($p = 0.861$)	56.53($p = 0.98$)	84.42($p = 0.980$)

This table presents regression results for risk governance mechanisms, bank risk-taking and performance for full sample using GMM estimations to control for endogeneity.
All variables are as defined in Appendix. t-statistics in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.

first differences are correlated. The AR(2) tests are not significant in all of our models, indicating that it is not possible to reject the null hypothesis of no serial correlation in the second differences. Two further tests are important to justify the use of the system GMM approach. One is the Sargan test for over-identification and other is the Hansen test of exogeneity of the instruments. In our case, the null hypothesis of over-identified model is always rejected, while the Hansen test of exogeneity of the instruments does not reject the null hypothesis of valid (exogenous) instruments. Overall, these tests support the rationale for using the system GMM approach.

Table 6 reports the GMM results for the relationship between risk governance mechanisms, bank risk-taking and performance based on full sample, while Table 7 and 8 report the results for SOBs and POBs sample, respectively. The results reported in Tables 6 to 8 are qualitatively similar to those reported under main analysis and show evidence that risk governance mechanisms are effective at reducing bank risk-taking, but do not have any significant impact on financial performance in full sample. With regard to SOBs and POBs subsamples, the findings reported in Tables 7 and 8 reveal that risk governance mechanisms are more effective at reducing risk-taking and improving financial performance of POBs than SOBs. These findings lead to conclude that results reported in Table 4 and 5 are not subject to endogeneity.

Table 7
GMM estimations for the between risk governance, bank risk taking and performance for SOBs.

Variables	(1)	(2)	**(3)**	**(4)**	**(5)**
	CR	**LR**	**ZScore**	**OR**	**Tobin Q**
Dependent Variable$_{(t-1)}$	0.508***	0.801***	1.025***	0.810***	0.941***
	(65.10)	(86.88)	(85.26)	(197.79)	(4.95)
RC	−0.001	−1.208***	−0.105	−0.002	−0.318
	(-0.07)	(-3.71)	(-1.04)	(-0.08)	(-0.03)
RC_Size	−0.006***	0.001	0.010	−0.002	0.097
	(-3.65)	(0.49)	(1.27)	(-0.50)	(0.12)
RC_Meetings	−0.003	−0.004***	0.001	−0.007	0.014
	(-0.74)	(-3.46)	(0.45)	(-0.86)	(0.06)
CRO	−0.025***	−0.468	−0.105	−0.062	−0.826
	(-2.95)	(-1.59)	(-0.81)	(-0.98)	(-0.07)
CRO_Ind	−0.033***	−0.798***	0.126***	−0.082***	−0.856
	(-3.13)	(-2.82)	(2.59)	(-2.93)	(-0.11)
BOARD_SIZE	0.006***	−0.001	−0.001	−0.001	−0.221
	(3.90)	(0.14)	(-0.89)	(-0.10)	(-0.28)
BOARD_IND	−0.011***	0.095***	0.040*	0.013	−0.169
	(-6.44)	(2.56)	(1.78)	(0.80)	(-0.03)
DUAL	0.003***	0.113***	−0.032**	0.003	0.010
	(2.74)	(3.46)	(-2.26)	(0.03)	(0.00)
CON_OWN	0.022***	−0.744***	−0.243*	0.003	0.738
	(3.67)	(-5.12)	(-1.94)	(0.01)	(0.05)
INST_OWN	0.004	1.008***	0.179	0.014	−4.992
	(0.45)	(4.57)	(0.90)	(0.21)	(-0.26)
BANK_SIZE	0.001	−0.033***	−0.043***	−0.004	0.111
	(0.63)	(-2.79)	(-7.47)	(-1.15)	(0.15)
INC_DIV	−0.044***	0.095***	−0.183***	−0.013	0.157
	(-4.59)	(3.04)	(-4.58)	(-0.74)	(0.02)
DEP	0.001	−0.369***	0.560***	0.023**	−0.252
	(0.16)	(-4.78)	(9.16)	(1.97)	(-0.03)
GDP	−0.009	−0.031**	0.050***	0.003	0.543
	(-1.09)	(-2.25)	(6.56)	(0.60)	(0.44)
GPS	−0.002	0.977***	0.051	0.008	−4.425
	(-0.51)	(4.73)	(0.53)	(0.22)	(-0.25)
LAW_INDEX	−0.008	−0.499***	0.044	−0.045	−1.616
	(-1.37)	(-3.28)	(0.81)	(-1.34)	(-0.08)
Intercept	−0.015	2.902***	−0.468***	0.085	−4.206
Country effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Number of observations	476	476	469	476	418
F (Prob > F)	3347.96***	3984.69***	5459.74***	7942.41***	16.12***
Arellano–Bond test AR(1) (z, *p*–value):	−3.92($p = 0.000$)	−3.59($p = 0.000$)	−4.58($p = 0.000$)	−3.28($p = 0.000$)	−3.49($p = 0.000$)
Arellano–Bond test AR(2) (z, *p*–value):	0.17($p = 0.862$)	−0.92($p = 0.360$)	1.28($p = 0.280$)	−1.00($p = 0.317$)	−0.90($p = 0.352$)
Sargan test (Chi–square, *p*–value):	164.01($p = 0.000$)	363.60($p = 0.000$)	890.13($p = 0.000$)	284.47($p = 0.000$)	282.30($p = 0.000$)
Hansen test (Chi–square, *p*–value):	52.31($p = 0.999$)	43.15($p = 1.000$)	45.54($p = 1.000$)	17.69($p = 1.000$)	14.86($p = 1.000$)

This table presents regression results for risk governance mechanisms, bank risk-taking and performance for SOBs sample using GMM estimations to control for endogeneity.
All variables are as defined in Appendix.
t-statistics in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.

Table 8
GMM estimations for the between risk governance, bank risk taking and performance for POBs.

Variables	(1)	(2)	(3)	(4)	(5)
	CR	**LR**	**ZScore**	**OR**	**Tobin Q**
Dependent Variable$_{(t-1)}$	0.828***	0.625***	0.951***	0.900***	0.265***
	(353.81)	(61.06)	(128.00)	(166.96)	(30.16)
RC	0.006	−0.039***	0.168***	−0.014***	0.060***
	(1.52)	(-3.62)	(4.88)	(-5.83)	(10.68)
RC_Size	−0.009***	−0.013***	0.004**(2.49)	−0.002***	0.001
	(-12.68)	(–22.40)		(-15.17)	(1.57)
RC_Meetings	−0.001***	−0.010***	0.001	−0.001	0.002***
	(-4.97)	(-14.33)	(0.05)	(-1.21)	(5.64)
CRO	0.052	−0.035***	0.220***	−0.002	0.042***
	(1.39)	(-2.92)	(11.49)	(-0.60)	(5.37)
CRO_Ind	−0.062***	−0.058***	0.235***	−0.032***	0.056***
	(-14.11)	(-3.58)	(12.50)	(-4.62)	(5.81)
BOARD_SIZE	−0.001***	0.001	0.004***	0.021***	−0.002***
	(-3.58)	(0.31)	(4.42)	(2.89)	(-5.98)
BOARD_IND	0.021***	0.002	0.064***	0.026***(14.91)	−0.001
	(4.90)	(0.23)	(3.48)		(-0.03)
DUAL	−0.018***	−0.028*	−0.020	−0.005***	−0.004
	(-4.06)	(-1.79)	(-1.03)	(-3.86)	(-0.65)
CON_OWN	0.038***	−0.015	0.046**	−0.003**	0.025***
	(6.05)	(-1.40)	(2.49)	(-2.20)	(3.68)
INST_OWN	−0.043***	0.046***	0.034*	−0.001	−0.045***
	(-7.74)	(4.52)	(1.92)	(-0.73)	(7.87)
BANK_SIZE	0.003**	−0.019***	0.011***	−0.055**	−0.009***
	(2.76)	(-8.04)	(3.84)	(-2.20)	(-6.35)
INC_DIV	−0.007***	0.027***	−0.015***	−0.001***	0.000
	(-4.25)	(6.25)	(-3.03)	(-3.54)	(0.28)
DEP	−0.034***	−0.257***	0.497***	0.008***	−0.015*
	(-5.44)	(-10.11)	(13.60)	(5.06)	(-1.68)
GDP	−0.002	0.004	0.030***	0.001	0.013***
	(-1.13)	(1.21)	(6.01)	(0.87)	(7.84)
GPS	0.066***	0.102***	0.355***	−0.005	−0.091***
	(7.83)	(4.87)	(6.08)	(-1.62)	(-6.31)
LAW_INDEX	−0.068***	−0.022	−0.043	−0.018	0.100***
	(-7.33)	(-1.23)	(-1.17)	(-7.38)	(9.06)
Intercept	−0.006	0.631***	−1.124***	−0.001	0.652***
Country effects	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes
Number of observations	812	814	807	814	807
F (Prob > F)	31889.39***	2200.70***	14246.51***	11831.28***	163.15***
Arellano–Bond test AR(1) (z, *p*–value):	−2.94($p = 0.000$)	−3.32($p = 0.000$)	−3.04($p = 0.000$)	−3.53($p = 0.000$)	−3.97($p = 0.000$)
Arellano–Bond test AR(2) (z, *p*–value):	−0.86($p = 0.387$)	−0.47($p = 0.639$)	1.14($p = 0.255$)	0.82($p = 0.411$)	1.36($p = 0.173$)
Sargan test (Chi–square, *p*–value):	219.78($p = 0.000$)	206.94($p = 0.000$)	251.11($p = 0.000$)	252.25($p = 0.000$)	214.47($p = 0.000$)
Hansen test (Chi–square, *p*–value):	87.00($p = 0.940$)	92.01($p = 0.879$)	86.77($p = 0.943$)	89.65($p = 0.912$)	101.85($p = 0.673$)

This table presents regression results for risk governance mechanisms, bank risk-taking and performance for POBs sample using GMM estimations to control for endogeneity.
All variables are as defined in Appendix.
t-statistics in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01.

4.2.3. Robustness analysis

In addition to the system GMM regression analysis, we perform several robustness tests to corroborate our main findings. First, we use the lagged independent variable approach and re-examine the relation between risk governance mechanisms, bank risk-taking and performance. The results of this analysis, reported in Table 9, are comparable with our main results as they indicate that risk governance mechanisms are helpful in reducing bank risk-taking, but do not have any significant impact on financial performance of banks.

Second, we perform alternate sample analysis because our sample is dominated by three countries: Bangladesh (15.7% observations), China (11.35% observations), and India (17.3% observations). Collectively, 44% of the sample banks belong to these countries. In order to ensure that findings reported under the main analysis are not driven by the presence of these three countries in our sample, we follow Samet et al. (2018) and re-examine the association between risk governance mechanisms, bank risk-taking and performance after excluding banks belonging to these three countries. The results reported in Table 10 are also qualitatively similar to those reported under main analysis, thus suggesting that banks belonging to the countries dominating the sample do not drive our results.

Table 9
Regression results using lagged risk governance mechanisms.

Variables	(1)	(2)	(3)	(4)	(5)
	CR	**LR**	**ZScore**	**OR**	**Tobin Q**
RC_{t-1}	−0.076***	−0.855***	0.158***	−0.039*	−0.303
	(-2.27)	(-9.41)	(2.48)	(-1.68)	(-0.10)
RC_Size_{t-1}	−0.005	0.010	0.004	0.001	−0.062
	(-1.37)	(1.10)	(1.17)	(0.25)	(-0.200
$RC\_Meetings_{t-1}$	−0.007***	−0.009***	0.008**	−0.000	0.039
	(-3.23)	(-1.67)	(2.33)	(-0.14)	(0.21)
CRO_{t-1}	−0.003	−0.732***	0.097*	−0.027**	−1.797
	(-0.11)	(-8.67)	(1.61)	(-2.43)	(-0.66)
CRO_Ind_{t-1}	−0.029***	−1.151***	0.132***	−0.031*	−2.126
	(-3.10)	(-10.29)	(2.52)	(-1.69)	(-1.21)
BOARD_SIZE	−0.000	−0.007	0.000	−0.004	0.018
	(-0.40)	(-1.18)	(0.10)	(-1.03)	(0.09)
BOARD_IND	0.067*	−0.083	0.139**	0.080	−1.849
	(1.83)	(-0.88)	(2.16)	(1.17)	(-0.60)
DUAL	−0.017	0.040	0.017	0.196***	−0.901
	(-0.71)	(0.60)	(0.35)	(3.79)	(-0.43)
CON_OWN	0.103	−0.101	−0.136	0.013	0.823
	(1.58)	(-0.56)	(-1.05)	(0.10)	(0.15)
INST_OWN	−0.141**	0.228	0.392***	−0.003	−0.941
	(-2.34)	(1.36)	(3.23)	(-0.02)	(-0.18)
BANK_SIZE	0.003	−0.083***	−0.270***	−0.016	−0.181
	(0.37)	(-3.14)	(-10.93)	(-0.71)	(-0.24)
INC_DIV	−0.025*	0.060*	−0.118***	−0.028	−0.265
	(-1.91)	(1.77)	(-4.48)	(-1.17)	(-0.21)
DEP	−0.103**	−1.067***	0.687***	−0.034	0.550
	(-2.26)	(-8.83)	(7.99)	(-0.39)	(0.14)
GDP	−0.004	0.023	0.321***	−0.006	1.045
	(-0.34)	(0.54)	(7.48)	(-0.17)	(0.90)
GPS	0.087	−0.228	−0.527**	0.093	−8.159
	(1.00)	(-0.90)	(-2.71)	(0.46)	(-1.09)
LAW_INDEX	−0.030	−0.006	0.376**	0.036	6.815
	(-0.39)	(-0.03)	(2.17)	(0.21)	(1.01)
Intercept	0.173	2.631***	0.499	0.555	−15.312
Overall R^2	0.23	0.14	0.21	0.18	0.15
Number of observations	1289	1290	1276	1290	1226
Wald Chi^2	39.82***	213.11***	389.33***	55.59***	55.67***

This table presents GLS random effect estimation results for lagged risk governance mechanisms, bank risk-taking and performance for full sample. All variables are as defined in Appendix.
Z-statistics in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01

5. Conclusion

The excessive risk-taking of banks and ineffective governance structure have been the most criticized aspect of the financial crisis. The current study attempts to broaden our understanding about the risk governance mechanisms and bank risk-taking by focusing on a sample of Asian banks that include both state-owned and privately-owned banks. Unlike most of the previous studies, we consider bank-wide risk-taking covering four different aspects of the risk, namely credit risk, liquidity risk, insolvency risk, and operational risk.

Our results indicate that risk governance mechanisms significantly reduce bank risk-taking but do not have any impact on financial performance. The results of the subsample analysis, however, reveal that the effect of risk governance mechanisms on bank risk-taking holds for privately-owned banks, but not for state-owned banks. Additionally, the association between risk governance mechanisms and bank performance is only significant for privately-owned banks. These findings imply that risk governance structures are more robust in privately-owned banks which allow them to convert higher credit risk in profit maximization and value creation.

Overall, our results are consistent with the notion that risk mitigation mechanisms propels banks to adopt conservative risk management policies affecting bank performance. Given that the reduction in the risk-taking occurs more intensely in privately-owned banks compared to state-owned banks, we can infer that risk governance structures are only in place to symbolically establish legitimacy with the stakeholders in state-owned banks. By contrast, the risk governance mechanisms are used effectively to monitor the managerial risk-taking as well as to improve financial performance in privately-owned banks. Accordingly, we empirically validate the arguments of Brown et al. (2009) that the institutional framework within which the firms operate can determine the adoption of risk management practices and policies.

Our findings have implications for regulators and shareholders since the research question in this study directly addresses public policy concerns in the financial industry and show the benefits of effective and independent risk governance in mitigating bank risk-taking and strengthening the risk management function. This evidence is also valuable to investors who can decide whether to include an additional risk premium in their required return calculations in relation to the bank's ownership status. Finally, our results can also

Table 10
Regression results on the association between risk governance, bank risk-taking and performance after excluding banks from Bangladesh, China and India.

Variables	(1)	(2)	(3)	(4)	(5)
	CR	**LR**	**ZScore**	**OR**	**Tobin Q**
RC	−0.124***	−0.820***	0.158*	−0.227**	−0.347
	(-2.73)	(-6.32)	(1.95)	(-2.15)	(-0.08)
RC_Size	−0.010**	−0.021	0.008	−0.008	0.018
	(-1.94)	(-1.50)	(0.96)	(-0.79)	(0.04)
RC_Meetings	−0.013***	−0.002	0.010**	0.004	0.087
	(-3.51)	(-0.23)	(2.01)	(0.64)	(0.32)
CRO	−0.007	−0.690***	0.125	−0.271***	−3.590
	(-0.19)	(-5.81)	(1.46)	(-2.76)	(-0.89)
CRO_Ind	−0.019***	0.735***	0.225***	−0.325***	−4.560
	(-3.23)	(-7.82)	(3.76)	(-3.15)	(-1.10)
BOARD_SIZE	0.002	−0.021**	−0.011	0.000	−0.245
	(0.67)	(-1.98)	(-1.63)	(0.05)	(-0.60)
BOARD_IND	0.096**	−0.091	0.038	0.065	−1.718
	(2.07)	(-0.72)	(0.51)	(0.66)	(-0.38)
DUAL	−0.042	0.114	−0.007	0.463***	−1.348
	(-0.91)	(0.85)	(-0.69)	(4.15)	(-0.29)
CON_OWN	0.315***	0.278	−0.305	0.001	−2.148
	(2.42)	(0.72)	(-1.24)	(0.00)	(-0.17)
INST_OWN	−0.429***	−0.155	0.427*	0.039	3.144
	(-3.24)	(-0.40)	(1.73)	(0.12)	(0.25)
BANK_SIZE	0.006	−0.065	−0.166***	0.019	−1.330
	(0.51)	(-1.44)	(-4.94)	(0.45)	(-0.97)
INC_DIV	−0.019	0.089**	−0.057*	−0.037	−0.493
	(-1.20)	(2.08)	(-1.93)	(-1.11)	(-0.28)
DEP	−0.134**	−1.591***	−0.059	0.022	3.214
	(-2.02)	(-8.71)	(-0.54)	(0.16)	(0.46)
GDP	−0.016	−0.025	0.170**	−0.084	4.672*
	(-0.61)	(-0.28)	(2.31)	(-0.93)	(1.67)
GPS	0.155	−0.388	0.034	0.133	−6.350
	(1.43)	(-1.20)	(0.16)	(0.49)	(-0.61)
LAW_INDEX	−0.202*	−0.050	0.366	−0.189	6.705
	(-1.68)	(-0.15)	(1.63)	(-0.65)	(0.57)
Intercept	0.477	3.914	2.541**	1.833	−66.937
Overall R^2	0.23	0.18	0.19	0.18	0.16
Number of observations	818	819	811	819	745
Wald Chi^2	43.69***	150.29***	52.62***	63.74***	66.61***

This table presents GLS random effect estimation results for lagged risk governance mechanisms, bank risk-taking and performance excluding banks from Bangladesh, China and India.
All variables are as defined in Appendix.
Z-statistics in parentheses. *p < 0.10; **p < 0.05; ***p < 0.01

benefit credit rating agencies in their assessment of the risk of privately-owned and state-owned banks as well as regulators and policymakers who assess the quality of mechanisms aimed at disciplining banks' risk-taking behavior. It would be worth noting that, due to data unavailability, this study was only able to assess the relation between risk governance mechanisms and risk management effectiveness in the post-crisis period. Future research could extend our study by investigating the impact of attributes, skills, expertise and demographics of board and risk committee members on the risk-taking behavior of banks. Furthermore, social factors could also be considered as they may also impact banks' risk-taking behavior and performance in certain contexts.[5]

CRediT authorship contribution statement

Ammar Abid: Validation, Writing – review & editing, Supervision. **Ammar Ali Gull:** Conceptualization, Methodology, Writing – original draft, Investigation, Software. **Nazim Hussain:** Writing – original draft, Investigation, Software. **Duc Khuong Nguyen:** Validation, Writing – review & editing, Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

[5] We thank an anonymous reviewer for suggesting this research direction.

Appendix. Definition of variables

Variable	Definition	Measure [a]
Dependent Variables:		
CR	Credit Risk	The ratio of loan loss provisions to total gross loans.
LR	Liquidity Risk	The ratio of total gross loans to total deposits.
ZScore	Insolvency Risk	Insolvency risk is measured by natural logarithm of Z-Score, which equals (ROA + CAR)/σ(ROA), where ROA equals earnings before taxes and loan loss provisions divided by total assets and CAR equals equity divided by total assets.
OR	Operational Risk	Operational Risk is measured by the standard deviation of ROA.
Tobin Q	Market Performance	Market value of Equity plus the book value of liabilities divided by book value of total assets.
Risk Governance Variables:		
RC	Risk Committee	Dummy variable coded "1″ if the bank has dedicated board level risk committee and "0" otherwise.
RCSize	Risk Committee Size	The number of members on the risk committee
RCMeetings	Risk Committee Meetings	The number of risk committee meetings held in a financial year.
CRO	Chief Risk Officer	Dummy variable coded "1″ if CRO position is present in a bank and "0" otherwise.
CROInd	CRO Independence	Dummy variable coded "1″ if CRO is reporting directly to the board and "0" otherwise.
Corporate Governance Variables:		
BOARD_SIZE	Board size	The total number of directors on the board.
BOARD_IND	Board independence	Ratio of non-executive independent directors to total number of directors.
DUAL	CEO duality	Dummy variable coded "1″ if the CEO serves as board Chair and "0" otherwise.
CON_OWN	Concentrated ownership	Percentage of shares held by five largest shareholders.
INST_OWN	Institutional ownership	Percentage of shares held by institutional investors.
Bank and Country Level Variables:		
BANK_SIZE	Bank Size	Natural logarithm of total assets of the bank.
INC_DIV	Income Diversification	Ratio of non-interest income to total operating income.
DEP	Deposit Ratio	Ratio of total deposits to total assets.
GDP	Gross Domestic Product	Natural logarithm of GDP in US dollars.
GPS	Gross Private Savings	Ratio of Gross private savings to GDP.
LAW_INDEX	Country Level Governance	Measure of the effectiveness of legal system and investors' rights protection measured by six indicators by International Risk Guide (IRG).
SOB	State owned banks	Dummy variable coded "1″ if the bank is state owned and "0" otherwise.

[a]Variables are winsorized at the 1% and 99% levels.

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