**The Impact of Ownership and Regulations on Bank Risk-Taking: Evidence from the
Middle East and North Africa (MENA) region**

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Abstract

This paper examines how bank regulations and ownership structure individually and interactively influence bank risk-taking behaviour. We use generalised method of moments (GMM) estimation technique to analyze unbalanced panel data on 153 commercial banks from 12 Middle East and North Africa (MENA) countries. Predictably, foreign ownership is found to be inversely related to portfolio risk in all specifications, while government ownership shows positive association with portfolio risk only among the non-GCC (Gulf Cooperative Council) banks. We also find supervisory power having a positive effect on portfolio risk and a negative effect on credit risk, whereas activity restrictions show opposite effects on these two risk measures. In addition, these effects are reinforced for banks with higher ownership concentration and/or higher government ownership. The GCC banks show better results in relation to negative effects of capital regulations and market discipline on portfolio risk, although these effects are inconclusive in other specifications. Overall, our study results call for an increased activism of the policymakers and regulators in enforcing regulatory reform initiatives relating to ownership and other bank regulations.

Key Words: Ownership structure; bank regulations; risk-taking; MENA countries

JEL Classifications: G21, G28, G32

1. Introduction

The financial crisis of 2007-08 highlighted a number of weaknesses in corporate governance (CG) and risk management practices of banks in both developed and emerging economies. Available literature (such as Anderson 2009) suggests that a systematic breakdown in corporate governance and regulatory regimes influenced banks' risk-taking behaviour in the financial sector, and thus contributed to the severity of the financial crisis. In the wake of the crisis, the significance of the inter-relationships among internal corporate governance mechanism (such as, ownership), institutional governance mechanism (such as, bank regulations) and bank-risk taking has become more prominent to the policymakers to enhance banking sector stability and development.

Recognizing the significance of corporate governance and regulations, several studies (e.g., Laeven and Levine 2009; Shehzad et al. 2010) examine the effects of ownership and bank regulations on risk-taking, but they do not consider the impact of different types of ownership. Whilst Laeven and Levine (2009) consider the largest listed banks, Shehzad et al (2010) cover a shorter time span (2005-2007). The former deals with the default risk, whereas the latter includes credit risks and capital adequacy. A related literature (e.g., Barry et al. 2011; Haw et al. 2010 and Iannotta et al. 2007) address the impact of ownership on bank risks in Europe and East Asia. These studies are cross-sectional in nature and do not consider time variations in ownership. Similarly, Brissimis et al. (2008) and Agoraki et al. (2011) address the interrelationships among banking regulations, competition and risk-taking in European banking, but they do not consider bank-specific ownership variables. Likewise Forssbäck (2011)

and Angkinand and Wihlborg (2010) study the impact of deposit insurance, market discipline by creditors and ownership on bank risk-taking without considering the specific components of bank regulations.

Therefore, it is evident that existing literature does not fully capture the effects of concentration and types of ownership as well as bank regulations on bank risk-taking. Moreover, most studies appear to be either global or Europe-specific, with some recent studies focussing on emerging economies. However, no studies to date address this issue in the context of Middle East and North Africa (MENA) countries. Naceur and Omran (2011) address the effects of financial development, institutional factors and competition on bank performance in MENA countries, but they do not consider ownership structure and bank-risk taking. In addition, Farazi et al. (2011), Kobeissi and Sun (2010) and Kobeissi and Wang (2009) examine the effect of ownership structure on bank performance in MENA countries, without taking into consideration the effect of bank regulations.

This study attempts to address this gap by examining the impact of ownership and bank regulations on bank risk-taking in the context of MENA region. Considering the uniqueness in political and institutional settings and regulatory reforms, it is imperative to have a separate empirical framework to study MENA banking¹. As Kobeissi and Wang (2009) observe, the institutional environments, deregulation and privatisation processes in Arab countries are mostly relevant and specific to this region.

¹ See also, Agoraki et al. (2011)

A policy-oriented motivation of this study is to examine the effect of ongoing regulatory reform initiatives that started taking place in the most of MENA countries in the 2000s under the sponsorship of the multilateral organisations such as the World Bank (WB) and the International Monetary Fund (IMF). The Basel Committee provides structured framework for these regulatory reform initiatives in areas such as capital adequacy, disclosures, risk management, prudential regulations and corporate governance. (OECD 2009). These reforms were intended, among others, to reduce the risk-taking behaviour in the banking sector and to enhance financial stability. Whilst there has been a noticeable improvement in MENA countries in relation to the compliance of the Basel II capital requirements and the disclosure of off-balance sheet items and credit information, a lack of effective risk-based supervision and deposit insurance remain the main challenge to the development of regulatory framework (Mohseni-Cheraghlou 2012; WB 2011; Ayadi and De Groen 2013). Considering these variations in the degree of regulatory reform, it is worth examining the impact of individual component of bank regulations.

Moreover, a strong presence of government ownership and control, together with substantial entry barriers, may cause government banks to enjoy some competitive advantage over foreign-controlled banks in the Gulf Cooperative Council (GCC) countries (Ayadi and De Groen 2013). Likewise, Farazi et al. (2011) observe that it is premature to test the impact of foreign ownership on bank performance in most non-GCC countries, since the entry and expansion of foreign banks is a recent phenomenon in these countries. Moreover, IMF (2008) observes that the transfer of ownership is significantly lower in the MENA region, even though WB (2011) finds that state ownership has been on the decline and foreign ownership is on the rise.

Therefore, it would be interesting to see whether a change in ownership pattern can explain risk-taking behaviour of MENA banks. Furthermore, as Laeven and Levine (2009) argue, it is imperative to understand the effect of the interactions between bank regulations and ownership structures in examining bank risks.

Following this, we will examine how regulatory reform indicators and ownership variables individually and interactively shape risk-taking behaviour of a bank. We use an unbalanced panel dataset covering 1317 observations from 153 commercial banks based on 12 MENA countries over a period of 12 years (2001-2012). We use generalized method of moments (GMM) estimation technique to provide an empirical assessment of the following research questions from the perspective of MENA countries:

- (i) How do the concentration and types of ownership influence the risk-taking behaviour of a bank?
- (ii) How are bank regulations related to bank risk-taking?
- (iii) How do bank regulations interact with ownership variables in determining the risk of a bank?

The MENA region represents an interesting case for this study partly because of the dominance of concentrated banking sector in its financial system, together with unique ownership and regulatory structures, and monopolistic competition (Turk-Ariss 2009). In the presence of underdeveloped markets for equities and corporate bonds, bank loans constitute the most important form of external finance in the corporate sector of this region (OECD 2009). This, along with the opaqueness of

corporate borrowers, causes unique challenges for MENA banks (Koldertsova 2011). Moreover, as WB (2011) observes, the adoption of the Basel guidelines has contributed to some regional convergence of regulatory standards, although there are divergences among the MENA countries depending on the level of sophistication of a country's financial system. This type of study is likely to help the policymakers and practitioners to develop appropriate regulatory framework of corporate governance and risk management of a bank. Moreover, given the differences in ownership pattern and regulatory reform progress, it would be interesting to compare their effects between GCC and non-GCC banks. In addition, the time period of the study and the availability of data on World Bank's global banking, regulation and supervision survey (BRSS) 2011 give us an opportunity to compare the impact of regulatory reform between the pre-and post-crisis periods.

This paper makes a number of important contributions to the existing literature. We find that foreign ownership has an inverse effect on portfolio. Our evidence also suggests that activity restrictions and supervisory power have different effects on different risk measures, depending on the level of progress of the regulatory reform initiatives, together with the activism of the regulators. The estimation results of the GCC sub-sample show better results than the non-GCC banks in relation to negative effects of capital stringency, activity restrictions and market discipline on portfolio risk, and thus confirm the significance of implementing the regulatory reform. Interestingly, our evidence suggests that large owners adopted high risk-taking strategies prior to the financial crisis, although bank regulation variables cannot explain bank risk during the pre- and post-crisis periods. Overall, our study results

confirm the significance of interdependence between ownership and bank regulations in explaining risk-taking behaviour of a bank.

The rest of the paper is structured as follows. Section 2 provides a critical review of theoretical and empirical literature, and section 4 outlines empirical specifications and data. Section 5 provides empirical results and analysis, and section 6 concludes the paper with policy implications.

2. Literature review

2.1. Ownership structure and risk-taking behaviour:

Ownership concentration influences risk taking behaviour of a firm, even though there are disagreements among the researchers on how ownership concentration affects risk-taking. Agency theory suggests that higher cash-flow ownership of controlling shareholders reduces agency costs and improves firm performance (La Porta et al. 2002). In support of this argument, Iannotta et al. (2007) find that ownership concentration is associated with better loan quality, lower asset risk and lower insolvency risk. Shehzad et al. (2010) also find that ownership concentration reduces bank risk at lower levels of shareholder protection rights and supervisory control. However, Haw et al. (2010) argue that agency problems can be severer in the banking sector partly because of concentrated shareholding, which would lead to connected lending and relationship banking. Accordingly, they find that concentrated control exhibits greater return volatility and higher insolvency risks among listed commercial banks.

A related literature suggests that government ownership of banks might be justified from the perspective of social welfare arguments and the need to address monopoly power, externalities and distributional concerns (Shliefer and Vishny 1997). Whilst Otchere (2005) argues that government ownership in the financial sector is beneficial in countries with underdeveloped institutions, Haw et al. (2010) find that government control is subject to greater agency conflicts in countries with weak legal and regulatory institutions. Likewise, most studies argue that government ownership brings inefficiency because of the conflicts between social objectives and political interests, bureaucracy and corruptions, and interest group politics (Shliefer and Vishny 1997). Accordingly, several studies (s.g., Cornett et al. 2010; Iannotta et al. 2007) find that government-owned banks have poorer loan quality, higher credit risk, and higher insolvency risks than privately-owned banks in the Far East and European countries.

Foreign banks face liabilities of foreignness (LOF)², which includes additional operating costs in overseas markets, and the difficulties in adopting host country norms and practices (see Kobeissi and Sun 2010). The additional costs related to LOF can cause foreign banks to have greater risks. For example, Leye et al. (2007) find foreign banks having higher risks than domestic banks in Latin American countries. However, ‘global advantage hypothesis’ suggests that foreign banks might benefit from more advanced technologies, highly skilled labor force and better risk management (Lensink et al. (2008). This can help foreign banks to exploit bank-specific advantages and overcome the LOF in less competitive host countries

² Zaheer (1995: 342-343) defines ‘liabilities of foreignness’ (LOF) ‘all additional costs a firm operating in a market overseas incurs that a local firm would not incur’.

(Kobeissi and Sun 2010). Accordingly, many studies (for example, Taboada 2011; Micco et al. 2007) show that foreign banks outperform domestic banks in terms of profitability, cost efficiency and competitiveness in developing and emerging economies. Agoraki et al. (2011) also suggest that a higher presence of foreign banks in emerging markets results in lower bank risk-taking.

2.2. Bank regulations and risk-taking behaviour:

Andres and Vallelado (2008) argue that bank regulations reduce the effectiveness of other governance mechanisms through imposing ownership restrictions, or limiting operational activities, or reducing competition in the banking industry. Moreover, the main aim of the regulator, which is to reduce systemic risk, might come into conflict with the main goal of shareholders, which is to increase shareholder value. These conflicting goals generate new agency problems.

Fiordelisi et al. (2011) observe that the issue of whether higher capital requirements reduce overall banking risk has remained largely unresolved. Agoraki et al. (2011) and Bolt and Tieman (2004) observe that higher capital stringency requirements can cause entry barriers to newcomers, restrict competition, and force banks to take more prudent lending decisions, leading to lower bank risk. Repullo (2004) also argues that higher capital requirements may cause higher losses for bank shareholders in case of default, and hence lower incentives for risk-taking. Nevertheless, Laeven and Levine (2009) argue that capital regulations might induce owners to select a riskier investment portfolio in order to compensate for the loss of benefits from more stringent capital requirements.

Laeven and Levine (2009) further suggest that activity restrictions (such as securities and insurance underwriting) might reduce the utility of owning a bank, intensifying the risk-taking incentives of owners. A low degree of activity restrictions tends to enhance competition (Claessens and Laeven 2004), which in turn has a negative effect on profits, leading to greater risk-taking (Agoraki et al. 2011). However, activity restrictions can reduce the possibilities of risk diversification and the involvement of non-interest income related activities, leading to a decline in overall bank risk (See Claessens 2003, Lepetit et al. 2008; Agoraki et al. 2011).

Shehzad et al. (2010) argue that supervisory authorities act as the representatives of deposit holders and safeguard their interests through a check on banking policies, leading to a decline in bank risk. However, as the ‘political/regulatory capture’ hypothesis suggests, politically connected supervisors may not have the incentive and power to restrict risk-taking behaviour of powerful banks in emerging economies (Agoraki et al. 2011). Barth et al. (2004) also question the effectiveness of direct government supervision and regulation of bank activities.

Market discipline reduces the detrimental effects of concentrated control and risk-taking behaviour of a bank (Barry et al. 2011; Haw et al. 2010). However, Kwan (2004) casts doubt on the effectiveness of market discipline in limiting bank risk-taking. Forssbäck (2011) argues that market discipline has a limited effect on banks’ default risk, as opposed to its effect on asset risk. Forssbäck (2011) further mentions that deposit insurance creates moral hazard problem (Merton, 1977) by limiting a bank’s downside risk and encouraging risk-taking. However, he also observes that the

extent of these risk incentives depend on the scope (coverage) of the insurance and market discipline exerted by the creditors.

A number of recent studies address the inter-dependence between bank regulations and ownership structures in shaping the risk-taking behaviour of a bank. For example, Laeven and Levine (2009) posit that the effect of bank regulations on bank risk depends critically on each bank's ownership structure. However, Haw et al. (2010) find that country-level institutions play important roles in reducing the detrimental effect of concentrated control. Moreover, Shehzad et al. (2010) suggest that the effect of ownership concentration on bank risk depends on levels of shareholder protection rights and supervisory control. They also mention that ownership concentration matters less when regulatory control is stronger.

3. Empirical specifications and data

3.1. Sample and data

This study is based on an unbalanced panel dataset covering 1317 observations from 153 commercial banks based in 12 MENA countries, including six GCC countries (such as Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates) and six non-GCC countries (such as Algeria, Egypt, Jordan, Lebanon, Morocco and Syria). We use country-specific and bank-level data over a period of 12 years (2001-2012), which will allow us to fully exploit the variations in ownership and bank regulations. Moreover, as the theory of 'clean surplus' accounting suggests, analyzing a longer series of accounting data may help us to alleviate the concern about the unreliability

of accounting data (see Cornett et al. 2010). Depending on the availability, we use data from unconsolidated accounts wherever possible. Otherwise we use consolidated data. Both ownership and financial data are collected from the Bankscope database provided by Fitch/IBCA/Bureau Van Dijk, together with the annual reports and websites of the banks.

In addition, we use the WB database on bank regulations and supervision (Barth et al., 2001, 2006, 2008) and bank regulation survey (2011) to construct indices relating to capital stringency, restrictions on bank activities, supervisory power and market discipline³. Agoraki et al. (2011) argue that these indices can be more informative than the dummy variables, and allow us to consider a more harmonized measure. Since the WB datasets cover several points in time, we use 2000-dataset for bank observations of 2001 and 2002, 2003-dataset for bank observations over 2003-2007, 2008-dataset for bank observations over 2008-2010, and 2011-dataset for bank observations over 2011-2012. Moreover, WB's World Development Indicators, IMF's International Financial Statistics, OECD survey on CG in MENA countries, annual reports of the central banks have been consulted to collect macro-economic data.

3.2. *The model*

In order to examine the first two research questions, we specify the following empirical model:

$$\gamma_{it} = \beta_0 + \beta_1 \text{Own}_{it} + \beta_2 \text{Reg}_t + \beta_4 \text{X}_{it} + \beta_5 \text{C}_t + u_{it} \dots\dots\dots(1)$$

³ A description of the components of bank regulation indices is given in the appendix.

In this model, bank risk-taking γ of bank i in the year t is a function of ownership structure (Own), bank regulations (Reg) bank-specific control variables (X), country-specific control variables (C), and the error term u . Table 1 provides a description of all variables, along with the sources of data. In order to examine the effect of the interactions between ownership and bank regulations, the following equation is estimated. In addition to all explanatory and control variables of Eq. (1), this model incorporates interactions between ownership and regulations ($\text{Own}_{it} \times \text{Reg}_t$).

$$\gamma_{it} = \beta_0 + \beta_1 \text{Own}_{it} + \beta_2 \text{Reg}_t + \beta_3 (\text{Own}_{it} \times \text{Reg}_t) + \beta_4 X_{it} + \beta_5 C_t + u_{it} \dots \dots \dots (2)$$

We follow Barry et al. (2011) and Lepetit et al. (2008) in using portfolio risk⁴ measured by the ratio of return on assets (ROA) to the standard deviation of ROA. In order to facilitate interpretation, this variable is entered with a negative sign in the regression model. We use ROA data of the entire 12-year period to calculate σROA . In addition, we use a proxy for credit risk measured by the ratio of non-performing loans to total assets.

A number of recent studies (such as Agoraki et al. 2011; Forssbäck 2011; Laeven and Levine 2009) address concerns about potential endogeneity and reverse causality among ownership, regulations and bank-risk taking. In order to resolve these problems, we use dynamic two-step system generalized method of moments (GMM) panel data estimator, as proposed by Arellano and Bond (1991) and Blundell and

⁴ Angkinand and Wihlborg (2010) regard this as a measure of asset risk.

Bond (1998) with Windmeijer's (2005) finite sample correction. Standard errors are robust to panel-specific autocorrelation and heteroskedasticity.

We treat only the lagged dependent variables as endogenous, so that 'GMM-style' instruments of deeper lags are created. In addition, we use the first lags of all independent variables and country dummies as additional instruments. The validity of the instruments is tested using Hansen J statistic of over-identifying restrictions and Arellano-Bond test of the absence of serial autocorrelation. The null hypothesis of second-order autocorrelation [AR(2)] is rejected, and Hansen J statistics indicate that we cannot reject the null hypothesis of over-identifying restrictions. This suggests that the instruments are valid, since they are appropriately uncorrelated with the disturbance process.

****Insert Table 1 around here****

We use two ownership variables to measure internal corporate governance. These include concentration of ownership (e.g. percentage of shareholding of the largest shareholders) and the types of ownership (e.g. shareholdings of the government, foreign investors, institutions and banks). Among others, Iannotta et al (2007) and Shehzad et al (2010) use ownership concentration, and Barry et al. (2011) use various types of ownership as important determinants of bank-risk taking. We follow Laeven and Levine (2009) and Agoraki et al. (2011) in using deposit insurance dummy, along with the indices of capital stringency, activity restrictions, official supervisory power and market discipline as bank regulation variables. We also include a bank-level estimate of market power (measured by the Lerner index) as a determinant of bank

risk. We follow Agoraki et al. (2011) and Turk-Ariss (2010) in computing the Lerner index (details are shown in the appendix).

In order to control for other bank-specific determinants of bank risk-taking, we follow among others, Shehzad et al (2010) and Forssbäck (2011) in using capitalisation, liquidity, deposit, loan growth, bank size and operating performance as control variables in the regression models. In addition, we use natural logarithm of real GDP per capita, GDP growth, rate of inflation (GDP inflator), and real rate of interest to control for macroeconomic differences across countries.

****Insert Table 2 around here****

4. Empirical results and analysis

In this section, we present estimation results of empirical models and analyze the results with reference to the research questions.

4.1. Descriptive statistics and univariate analysis

Table 2 provides a description of the sample, together with the mean values and standard deviations of the main variables. It shows a highly concentrated ownership structure in MENA banking, with the mean value of highest shareholding being 52%. Foreign investors own around 31% shares among the sample banks, and this ownership is much higher among banks in Algeria (56%), Bahrain (48%), Egypt (46%) and Syria (42%). Farazi et al. (2011) observe foreign banks have increased

their market share in MENA countries and this increase is modest in the GCC countries and more significant in the non-GCC countries. Whilst overall government ownership is 17%, it is relatively higher in the UAE (32%), Algeria (30%), Morocco (29%) and Bahrain (24%). A recent WB report (2011) shows that state banks play a dominant role in the banking sectors of the UAE, Qatar, Saudi Arabia, Algeria, Syria, whereas Bahrain, Kuwait, Oman, Egypt, Jordan, Lebanon, Morocco, Tunisia and Yemen have sizable presence of the private sector banks. Table 2 also shows that the mean value of the Lerner index is 0.51, indicating the presence of monopolistic competition in MENA banking, and thus supporting the findings of Turk-Ariss (2010).

****Insert Table 3 around here****

Table 3 depicts t-test results showing comparisons between the sub-samples such as listed vs. unlisted, GCC vs. non-GCC, and pre-crisis vs. post-crisis. It shows that the listed banks have relatively higher portfolio risk, higher market power, lower government and foreign ownerships than the unlisted banks and that these differences are statistically significant. This evidence contradicts with Kobeissi and Wang (2009), who find publicly traded banks in MENA countries to be less risky. The table further shows that the GCC countries have relatively more stringent capital regulations, higher market discipline, higher market power, and less activity restrictions than the non-GCC countries. Finally, MENA banks experienced greater portfolio and credit risks, and higher market power during the pre-crisis period, whereas more stringent capital regulations and activity restrictions, and higher supervisory power were evident during the post-crisis period.

Table 4 shows correlations among the main variables. The ownership and regulatory variables appear to have weak and inconsistent relationships with the risk variables in the most cases. However, it is imperative to estimate multivariable models to examine these relationships.

****Insert Table 4 around here****

4.2. *Ownership structure and bank risk-taking*

Table 5 shows GMM regression results of two risk measures, namely, portfolio risk and credit risk. Columns 1 through 3 show regression results of the portfolio risk for the whole panel of banks, the GCC banks and the non-GCC banks, respectively, and columns 4 through 6 show estimation results of credit risk. Table 6 shows similar regression results for the sub-samples of the listed banks, and for pre- and post-crisis periods.

The tables show that foreign ownership maintains an inverse association with portfolio risk in all specifications. In addition, foreign ownership shows negative association with credit risk for the entire panel of banks as well as the listed banks. This evidence supports ‘global advantage hypothesis’, and corroborates Kobeissi and Wang (2009), who find similar evidence in MENA banking. This evidence suggests that foreign ownership plays a risk-stabilising role in the MENA countries. However, it contradicts with the evidence of Angkinand and Wihlborg (2010) in that foreign ownership is positively associated with bank risk in countries with low explicit deposit insurance coverage.

Government ownership is found to have a positive association with portfolio risk, and this relationship holds for the non-GCC banks and listed banks. This evidence suggests that political interventions in credit allocations, larger loan loss provisions and poor risk management (see also Farazi et al. 2011; Kobeissi and Sun 2010) tend to cause higher bank risks in government-controlled banks in the non-GCC countries. Whilst this evidence is consistent with related studies (such as Iannotta et al. 2007), the estimation results of the GCC banks is insignificant, indicating that the level of change in government ownership is too insignificant to explain bank risk-taking.

The explanatory power of ownership concentration appears inconsistent as a standalone variable. Interestingly, the estimation results of the pre-crisis period show government ownership having a positive relationship with portfolio risk, and ownership concentration having similar associations with both risk measures. This evidence suggests that large owners appeared to follow high risk taking strategies in MENA banking prior to the financial crisis. Overall, ownership variables do not seem to explain variations in credit risk very well. One of the reasons might be the limited availability of bank-level data on non-performing loans. Farazi et al. (2011) regard this as one of the constraints in determining asset quality of MENA banks.

****Insert Table 5 around here****

4.3. *Regulations and rank risk-taking*

Tables 5 and 6 also show the effects of bank regulations and deposit insurance on bank-risk taking. The tables show activity restrictions index having a positive effect on credit risk, a finding that holds for the sub-samples of non-GCC banks, listed banks and for pre- and post-crisis periods. This evidence supports related literature (see Laeven and Levine 2009) in that activity restrictions can influence banks to concentrate more on the loan market in order to compensate for the losses from the activity restrictions. Whilst higher activity restrictions protected non-GCC banks from the recent financial crisis, it might have forced banks to pursue risky lending strategies, leading to an increase in credit risk.

However, activity restrictions index shows a negative association with portfolio risk for the entire panel of banks, together with the GCC banks and listed banks, and thus supports the findings of Agoraki et al. (2011). This evidence suggests that higher degree of activity restrictions tend to reduce non-interest income related activities, leading to a decline in overall bank risk particularly in the GCC countries.

Predictably, supervisory power index shows negative association with credit risk in all specifications, with an exception to the non-GCC banks. In consistent with ‘supervisory power hypothesis’, this evidence suggests that a recent activism of the supervisory authorities in monitoring non-performing loans appears to have prevented banks from taking excessive credit risks in MENA countries, in general, and GCC countries, in particular. As Ayadi and De Groen (2013) observe, the GCC countries make substantial progress in relation to higher provisioning rate, tightening of personal loans, and the disclosure and sharing of credit information by financial institutions via public credit registries or private credit bureaus.

Nonetheless, supervisory power is found to have a positive effect on portfolio risk, and these results remain unchanged in the regressions for the GCC and non-GCC banks. This evidence corroborates with ‘political/regulatory capture’ hypothesis, and supports Haw et al. (2010), who assert that official supervisory power plays a weak governance role, and that higher government intervention intensifies the detrimental effect.

MENA banks hold large portfolio of government securities through participating in government debt auctions and lending to state enterprises, favoured sectors (such as real estate and construction) and large corporations including well-connected family firms (WB 2011). This may lead to higher concentration on loans and higher portfolio risk. In addition, independent but not empowered supervisors might be unable to deal with excessive political interference and various operational inefficiencies. As Ayadi and De Groen (2013) and Mohseni-Cheraghlou (2012) observe, the supervisory authorities of a number of GCC countries tend to have greater independence, but they do not have the power to replace management or to declare a bank insolvent. In addition, weaker political economy of the central banks, poor enforcement of regulatory guidelines, lack of effective risk-based supervision, and limited expertise of the supervisory staff (WB 2011) appear to have constrained the effectiveness of the supervisory authorities.

The estimation results of the GCC sub-sample show better results than the non-GCC banks in relation to negative effects of capital regulations and market discipline on portfolio risk, although these results remain insignificant or inconsistent in other

specifications. This evidence is consistent with the t-test results, and thus supports related literature (e.g., Mohseni-Cheraghloo 2012; Ayadi and De Groen 2013) in that the GCC banking sector has experienced greater reform in terms of increased capital adequacy ratio and increased disclosure requirements. Whilst a majority of MENA banks tend to comply with the minimum required capital asset ratio, a lack of bank-level compliance of the other provisions of capital stringency, together with poor market-oriented disclosure practices, might have resulted in inconclusive evidence. As the WB (2011) observes, MENA countries do not provide adequate incentives to the market participants to assess bank's capital over risk exposures.

The estimation results for the pre- and post-crisis periods do not suggest any change in the explanatory power of the regulatory variables, a finding that confirms the latest World Bank (2012) observation that the crisis has not caused major and sudden change in regulatory and supervisory framework as well as private incentives to monitor risk-taking. Likewise, the effect of deposit insurance on bank risk is statistically insignificant in most cases. This evidence is predictable, given that most of the MENA countries do not have explicit deposit insurance.

Among the control variables, liquid assets show negative associations with both risk measures, but the results for the sub-samples remain inconclusive. In addition, bank capitalisation shows a negative effect on portfolio risk except for the GCC banks. Similarly, loan growth shows negative association with credit risk with an exception to non-GCC banks. Surprisingly, the market power of a bank shows insignificant or inconsistent results in most cases.

****Insert Table 6 around here****

4.4. *Effect of the interaction between ownership and bank regulations on risk-taking*

Table 7 shows GMM regression results of Eq.(2). The specifications also include individual ownership and regulatory variables and other control variables. In estimating Eq. (2), we find the interaction terms to be highly collinear with their components. We follow Agoraki et al. (2011) in reducing multicollinearity problem by ‘centering’ the variables. This is done by subtracting the mean from each observation, prior to incorporating them into the specifications.

Panel A shows results of the interactions between ownership concentration and bank regulations, and Panel B shows results of the interactions between government ownership and bank regulations. In accordance with the results of previous specifications, the interactions of capital stringency and deposit insurance with ownership variables are largely inconclusive. Whilst foreign ownership shows an inverse effect on bank risk as a standalone variable, its interactions with regulatory variable are statistically insignificant (shown in Panel C). This evidence indicates that the risk taking behaviour foreign banks or foreign investors is part of the latter’s global strategy, which is less likely to be shaped by the regulatory provisions of the host country.

Whilst a negative effect of activity restrictions on portfolio risk is reinforced for banks with higher ownership concentration, its positive effect on credit risk is strengthened

for banks with higher government ownership. Laeven and Levine (2009) find similar evidence and suggest that when a bank has a large owner, activity restrictions increase bank risk.

In consistent with the evidence of Table 4, supervisory power index shows a positive effect on portfolio risk as an standalone variable, and this effect is strengthened for banks with higher ownership concentration and higher government ownership. In addition, a negative effect of supervisory power on credit risk is reinforced for banks with higher government control. This implies that official supervisory power not only reduces credit risk as standalone mechanism, but also reduces risk taking incentives of the government.

****Insert Table 7 around here****

4.5. *Robustness tests and further investigations*

We perform a number of robustness tests. First, in order to control time-invariant differences between countries, we run all specifications using country fixed effects (not reported) and find no significant differences with the reported results. This indicates that our results are not influenced by the differences across countries. Second, we estimate Eq. (1) for both risk variables with all independent variables lagged by one year. The results (not reported) show no significant qualitative differences with the reported findings. Third, we also estimate Eq. (1) by introducing our ownership and bank regulation variables one by one, along with the control variables. There are no noticeable differences in our overall results.

5. Conclusions and policy implications

In this paper, we examined the effects of bank regulations and ownership on both portfolio and credit risks of a bank. We find foreign ownership to be inversely related to portfolio risk in all specifications, while government ownership shows positive association with portfolio risk only among the non-GCC banks. Our evidence also suggests that large owners and government-controlled banks appeared to adopt high risk-taking strategies in MENA banking prior to the financial crisis.

We also find that supervisory power shows a positive association with portfolio risk and a negative association with credit risk, whereas activity restrictions show opposite effects on these two risk measures. Moreover, these effects are strengthened for banks with concentrated shareholding and/or higher government ownership. The estimation results for the GCC banks show capital regulations and market discipline having negative relationships with portfolio risk, although these effects are inconclusive in other specifications. The GCC banks further show supervisory power having an inverse effect on credit risk and a positive effect on portfolio risk. Our results also confirm the significance of interdependence between bank regulations and ownership structures in explaining bank risk-taking behaviour. Nonetheless, we find that bank regulation variables cannot explain variations in bank risk-taking during the pre- and post-crisis periods.

Our study results suggest that the regulators of the MENA countries should remove entry barriers to foreign banks and encourage foreign ownership in domestic banks.

This will reduce bank risk and enhance competition and financial sector stability. Whilst Turk-Ariss (2009) and Neceus and Omran (2011) advocate fewer activity restrictions to ensure market contestability and competitiveness in MENA banking, our evidence suggest that activity restrictions can reduce overall portfolio risk of a bank. Nonetheless, there should be adequate regulatory measures to restrict banks from taking excessive credit risks just to compensate losses from activity restrictions.

The regulatory reform initiatives in the GCC countries show partial success in relation to a risk-stabilizing effect of capital regulations, activity restrictions and market discipline, even though a majority of the non-GCC countries seem to be lagging behind in reforming and enforcing these bank regulations. Moreover, supervisory authorities of this region show some success in disciplining credit risk of a bank, but they seem to have failed in restricting overall portfolio risk of a bank. This calls for a major reform in areas such as the autonomy of the central banks, the power and expertise of the supervisors in disciplining bank risk-taking behaviour, etc. Our evidence also suggests an increased activism of the regulators to ensure greater enforcement of capital stringency provisions and market-oriented disclosures (especially in areas such as off-balance sheet and risk management issues, non-financial and ownership information, consolidated financial reporting, etc) in order to stabilise bank risk-taking and to enhance banking sector stability.

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Table 1. Variable definitions and data sources

<i>Variables</i>	<i>Symbols</i>	<i>Definitions</i>	<i>Data Sources</i>
<i>Risk taking behavior of banks:</i>			
Portfolio risk	portfolio	The ratio of return on assets (ROA) to the standard deviation of ROA [Higher values imply lower portfolio risk]	Bankscope
Credit risk	credit	The ratio of non-performing loan to total assets	Bankscope
<i>Ownership:</i>			
Ownership concentration	largest	The ownership percentage held by the largest shareholder	Bankscope
Institutional ownership	inst_own	Proportion of equity held by the institutional investors, such as insurance companies, financial companies and mutual and pension funds.	Bankscope
Government ownership	gov_own	Proportion of equity held by the government	Bankscope
Foreign ownership	forgn_ow	Proportion of equity held by foreign investors	Bankscope
Bank ownership	bnk_own	Proportion of equity held by the banks	Bankscope
<i>Institutional variables:</i>			
Bank regulation indices		Indices of capital stringency(CS), activity restrictions (AR), supervisory power (SP) and market discipline (MD) (see appendix A).	WB Survey (2000,2003, 2008, 2011)
Deposit insurance	di_dy	A dummy variable that takes a value of one if the country has deposit insurance, and zero otherwise.	
<i>Bank-level control variables:</i>			
Market power	LI	The Lerner index (see appendix B)	BankScope
Bank capitalization	equity	The ratio of total equity to total assets	BankScope
Bank size	size	Natural logarithm of total assets in thousands of USD	BankScope
Liquidity	liquidity	The ratio of liquid assets to total assets	BankScope
Deposit	deposit	The ratio of deposits to total assets	BankScope
Loan growth	loangr	% change in the amount of bank i's total customer loans from the year t-1 to year t.	Bankscope
Operating performance	op-exp	The ratio of total operating expenses to total operating income	Bankscope
<i>Country-level control variables:</i>			
Interest rate	r_interest	Real interest rate (%)	WDI/UN/I MF
Inflation	inflation	Rate of inflation (%)	WDI/UN/I MF/Central banks
Income level	lngdppc	Natural logarithm of gross domestic product (GDP) per capita of the country.	WDI
GDP Growth	gdpg	The growth rate of real GDP (constant 2000 prices)	WDI
Country Dummies	c_dummy	Each dummy variable is equal to one if the bank nationality is that of the corresponding country and zero otherwise	

Table 2. Summary statistics of the variables across countries

Variables	ALL		Algeria	Bahrain	Egypt	Jordan	Saudi Arabia	Kuwait	Lebanon	Morocco	Oman	Qatar	Syria	UAE
	Mean	(SD)												
Portfolio risk	-1.24	(2.12)	-0.83	-1.09	-0.90	-1.38	-0.91	-1.27	-1.19	-3.54	-2.68	-1.42	-0.53	-0.98
Credit risk	0.04	(0.07)	0.01	0.06	0.05	0.08	0.02	0.04	0.05	0.04	0.06	0.03	0.02	0.04
Own. concentratn	0.52	(0.30)	0.75	0.38	0.71	0.30	0.39	0.33	0.59	0.63	0.29	0.40	0.46	0.47
Govt. Ownership	0.17	(0.29)	0.30	0.24	0.21	0.14	0.14	0.02	0.00	0.29	0.09	0.16	0.07	0.32
Foreign Ownership	0.31	(0.49)	0.56	0.48	0.46	0.31	0.24	0.15	0.25	0.28	0.17	0.13	0.42	0.11
Institutional Ownership	0.08	(0.17)	0.08	0.16	0.09	0.07	0.13	0.10	0.06	0.16	0.11	0.11	0.02	0.03
Bank Ownership	0.31	(0.36)	0.53	0.37	0.52	0.22	0.20	0.22	0.25	0.44	0.29	0.12	0.46	0.10
Capital stringency	6.53	(1.48)	6.17	7.38	4.65	7.40	5.54	7.67	7.64	5.73	6.91	5.56	5.28	7.63
Activity restrictions	2.51	(0.39)	2.27	2.35	2.62	2.70	2.89	2.04	2.64	2.89	2.89	1.86	2.72	2.15
Supervisory power	12.75	(1.55)	13.00	13.52	13.37	10.53	13.46	10.76	12.78	12.53	13.13	11.16	13.26	13.22
Market discipline	6.85	(0.94)	5.54	7.00	7.61	6.53	7.00	7.57	6.13	6.95	5.98	6.92	7.00	8.00
Liquid assets	0.33	(0.17)	0.45	0.31	0.37	0.34	0.20	0.31	0.36	0.26	0.23	0.26	0.52	0.24
Market power	0.51	(0.49)	0.52	0.47	0.39	0.48	0.58	0.59	0.40	0.48	0.52	0.58	0.83	0.58
Operating Performance	1.08	(7.68)	0.67	1.13	0.58	0.96	0.65	0.87	2.12	1.28	0.83	0.78	1.38	0.74
Capitalization	0.13	(0.19)	0.20	0.17	0.09	0.12	0.13	0.12	0.10	0.08	0.13	0.16	0.19	0.17
Deposit	0.69	(0.17)	0.53	0.47	0.79	0.69	0.74	0.59	0.81	0.65	0.71	0.64	0.70	0.65
Loan growth	20.50	(43.27)	42.31	12.60	12.52	11.52	16.73	15.15	14.43	30.47	15.05	39.68	57.96	22.63
<i>GDP growth</i>	0.05	(0.05)	0.03	0.05	0.05	0.05	0.04	0.06	0.06	0.05	0.05	0.13	0.04	0.04
N. of Banks	153		14	11	22	10	9	6	31	10	6	7	11	16
N. of Obs.	1317		120	92	210	95	98	54	260	64	56	61	50	157

Notes: The table shows the mean values of all important variables across countries. It also shows total number of banks and observations taken from every country.

Table 3. Mean values and t-tests between sub-samples

	<i>Mean</i>			<i>Mean</i>			<i>Mean</i>		
Variables	Listed	Unlisted	Difference (t-statistics)	GCC	Non-GCC	Difference (t-statistics)	Pre-crisis	Post-crisis	Difference (t-statistics)
Portfolio risk	-1.110	-1.396	0.285***	-1.251	-1.229	-0.021	-0.984	-1.517	0.533***
Credit risk	0.044	0.045	-0.001	0.040	0.049	-0.009**	0.054	0.035	0.019***
Own. concentratn	0.384	0.698	-0.314***	0.396	0.607	-0.211***	0.519	0.529	-0.010
Govt. Ownership	0.143	0.193	-0.049***	0.196	0.145	0.051***	0.179	0.150	0.029**
Foreign Ownership	0.243	0.389	-0.147***	0.213	0.370	-0.157***	0.261	0.360	-0.099***
Bank Ownership	0.225	0.425	-0.201***	0.201	0.388	-0.187***	0.268	0.365	-0.098***
Capital stringency	6.652	6.372	0.279***	6.873	6.303	0.570***	6.360	6.710	-0.350***
Activity restrictions	2.492	2.538	-0.046**	2.359	2.611	-0.252***	2.446	2.585	-0.140***
Supervisory power	12.508	13.048	-0.540***	12.809	12.710	0.099	12.681	12.823	-0.143*
Market discipline	7.088	6.558	0.530***	7.243	6.597	0.646***	6.817	6.889	-0.071*
Liquid assets	0.283	0.381	-0.099***	0.253	0.374	-0.121***	0.351	0.299	0.052***
Market power	0.268	0.143	0.125***	0.288	0.156	0.132***	0.237	0.202	0.035
Capitalization	0.135	0.131	0.005***	0.152	0.121	0.030	0.120	0.148	-0.029***
n	729	588		518	799		689	628	

Notes: Columns 4, 7 and 10 show the difference (t-statistics) in the means of firm characteristics between the two sub-samples such as listed and unlisted, GCC and non-GCC, and pre- and post-crisis periods. ***, ** and * indicate statistical significance at 1, 5 and 10% levels, respectively.

Table 4. Correlation matrix

	Variables	1	2	3	4	5	6	7	8	9	10	11	12
1	Portfolio risk	1											
2	Credit risk	0.13	1										
3	Market power	-0.17	-0.25	1									
4	Own. concentratn	0.04	-0.04	-0.17	1								
5	Govt. Ownership	0.09	-0.05	0.17	0.07	1							
6	Foreign Ownership	-0.06	-0.07	-0.11	0.27	-0.12	1						
7	Inst. ownership	0.02	-0.04	-0.04	0.03	-0.06	0.00	1					
8	Bank Ownership	-0.14	-0.03	-0.10	0.45	-0.19	0.67	-0.16	1				
9	Capital stringency	0.00	0.08	-0.09	0.00	-0.02	-0.12	-0.07	-0.12	1			
10	Activity restrictions	-0.12	0.03	-0.22	0.01	-0.15	0.14	0.06	0.15	-0.07	1		
11	Supervisory power	0.04	-0.08	-0.07	0.16	0.11	0.05	-0.01	0.04	0.06	0.12	1	
12	Market discipline	0.08	-0.03	0.32	-0.05	0.33	-0.12	-0.02	-0.13	-0.13	-0.35	0.05	1
13	Deposit insurance	-0.11	0.17	-0.38	0.04	-0.13	0.11	0.01	0.08	0.40	0.33	-0.04	-0.47

Notes: This correlation matrix is based on the entire sample of 1317 observations.

Table 5. GMM regression results of portfolio and credit risks against ownership and bank regulations

	Portfolio Risk			Credit Risk		
	1	2	3	4	5	6
Variables	ALL	GCC	Non-GCC	ALL	GCC	Non-GCC
Lagged dependent variable	0.775*** (0.05)	0.708*** (0.16)	-0.106 (0.14)	0.461*** (0.08)	0.720*** (0.04)	0.449*** (0.087)
Own. concentration	-0.456** (0.21)	0.237 (0.87)	-0.657 (1.35)	0.406** (0.19)	0.015 (0.01)	-0.015 (0.036)
Govt. ownership	0.521** (0.23)	1.071 (1.02)	2.452* (1.32)	0.019 (0.15)	-0.009 (0.01)	0.311 (0.252)
Foreign ownership	-0.353** (0.18)	-0.612*** (0.15)	-1.761** (0.71)	-0.169* (0.09)	0.00 (0.01)	-0.043 (0.033)
Institutional ownership	0.042 (0.27)	1.126 (0.91)	0.841* (0.47)	-0.191 (0.17)	-0.013 (0.01)	0.045* (0.024)
Banks ownership	0.215 (0.24)	0.17 (1.04)	1.009 (0.88)	-0.344* (0.19)	-0.018 (0.02)	0.064 (0.049)
Liquid assets	-0.764** (0.31)	-1.352 (0.85)	-1.089** (0.52)	-0.091** (0.04)	-0.025 (0.02)	-0.073 (0.051)
Size	-0.098 (0.06)	-0.789*** (0.23)	0.576 (0.55)	-0.022 (0.03)	-0.005 (0.00)	-0.147 (0.091)
Market power	-0.538 (0.42)	1.272 (0.78)	-2.233 (1.68)	-0.028 (0.03)	-0.08 (0.05)	-0.045 (0.099)
Operating performance	0.132 (0.12)	2.147*** (0.28)	0.089 (0.07)	0.001 (0.00)	-0.002 (0.00)	0.001 (0.003)
Capitalization	-0.399*** (0.09)	-2.565 (2.25)	-0.349*** (0.05)	-0.023 (0.02)	0.026 (0.08)	-0.009 (0.013)
Deposit	-0.48 (0.36)	-1.331 (1.07)	2.26 (1.66)	0.118 (0.09)	-0.002 (0.02)	0.455* (0.244)
Loan growth	0.00 (0.00)	-0.002 (0.00)	-0.002 (0.001)	-0.0002** (0.00)	-0.0002* (0.00)	-0.0002 (0.0001)
Capital stringency	0.058* (0.03)	-0.318** (0.15)	0.006 (0.09)	-0.011 (0.02)	0.002 (0.00)	-0.004 (0.005)
Activity restrictions	-0.405*** (0.12)	-0.258* (0.16)	-0.142 (0.41)	0.0801* (0.05)	0.005 (0.005)	0.0598* (0.034)
Supervisory power	0.089*** (0.03)	0.224** (0.10)	0.133*** (0.04)	-0.014* (0.01)	-0.005** (0.00)	-0.006 (0.004)
Market discipline	-0.0695* (0.04)	-0.110* (0.06)	0.494** (0.220)	-0.041 (0.03)	0.00 (0.00)	-0.005 (0.018)
Deposit insurance	-0.481*** (0.12)	0.282 (0.24)	0.33 (0.72)	-0.033 (0.05)	0.003 (0.00)	-0.015 (0.045)
Income level	-0.112** (0.06)	0.647 (0.62)	-2.228*** (0.81)	-0.028 (0.04)	-0.002 (0.01)	0.077 (0.075)

GDP growth	-0.38 (0.41)	-2.106 (1.36)	0.939* (0.51)	-0.031 (0.03)	-0.06 (0.05)	-0.06 (0.05)
Inflation	1.837** (0.85)	-0.329 (2.30)	7.993*** (2.58)	0.233 (0.18)	-0.086*** (0.03)	-0.015 (0.106)
Interest	2.99*** (0.85)	0.023 (2.04)	6.863** (2.97)	0.231 (0.16)	-0.0584* (0.03)	0.0003 (0.11)
Constant	2.89*** (1.12)				0.177* (0.10)	0.958** (0.46)
Observations	925	401	374	655	440	267
No.of banks	144	54	79	102	52	51
AR(1) (p-value)	0	0.01	0.05	0.1	0.14	0.25
AR(2) (p-value)	0.65	0.12	0.66	0.16	0.11	0.24
Hansen (p-value)	0.53	0.57	0.19	0.63	0.93	0.93

Notes: This table presents results based on dynamic two-step system GMM panel data estimator, as proposed by Arellano and Bond (1991) and Blundell and Bond (1998) with Windmeijer's (2005) finite sample correction. We use the lagged dependent variables as endogenous, so that 'GMM-style' instruments of deeper lags are created. AR(1) and AR(2) are the first and second order Arellano-Bond tests for serial autocorrelation and Hansen is a test of over-identifying restrictions. The tests reject the null hypotheses for second order serial autocorrelation and over-identifying restrictions. ***, ** and * indicate statistical significance at 1, 5 and 10% levels, respectively. The figures in parentheses are the heteroskedasticity-adjusted robust standard errors.

Table 6. GMM regression results of portfolio and credit risks against ownership and bank regulations across sub-samples

	Portfolio Risk			Credit Risk		
	1	2	3	4	5	6
Variables	Listed	Pre-crisis	Post-crisis	Listed	Pre-crisis	Post-crisis
Lagged dependent variable	0.305** (0.155)	-0.22 (0.15)	-0.317 (0.23)	0.609*** (0.10)	0.556*** (0.14)	0.759*** (0.18)
Own. concentration	-1.556 (0.948)	1.264* (0.76)	2.659 (2.63)	-0.087 (0.08)	0.199** (0.08)	0.005 (0.01)
Govt. ownership	3.010*** (1.033)	2.061* (1.15)	0.795 (1.12)	0.093 (0.06)	0.134 (0.11)	-0.001 (0.01)
Foreign ownership	-0.884*** (0.339)	-2.166* (1.20)	-11.02** (4.93)	-0.0706* (0.04)	-0.018 (0.24)	0.004 (0.00)
Institutional ownership	0.755 (1.262)	0.624 (0.38)	1.167 (2.06)	-0.026 (0.05)	-0.213 (0.34)	0.002 (0.02)
Banks ownership	2.918*** (0.940)	0.338 (0.43)	1.101 (1.75)	0.003 (0.06)	-0.255 (0.21)	-0.008 (0.02)
Liquid assets	-1.274* (0.679)	-0.003 (0.49)	0.602 (1.15)	-0.005 (0.03)	0.008 (0.10)	0.011 (0.03)
Size	-0.0939 (0.303)	0.372 (0.24)	-1.259* (0.74)	-0.0230** (0.01)	-0.031* (0.02)	-0.065*** (0.02)
Market power	2.511** (1.190)	-2.519** (0.98)	2.737 (2.28)	-0.0603* (0.03)	0.100 (0.17)	0.035 (0.04)
Operating performance	1.216*** (0.272)	0.166 (0.17)	1.705*** (0.28)	-0.004 (0.01)	0.001 (0.03)	-0.004* (0.00)
Capitalization	-6.766** (2.877)	-2.580* (1.53)	-0.215** (0.10)	-0.482 (0.33)	-0.684** (0.33)	0.002** (0.00)
Deposit	0.751 (1.049)	1.137 (1.04)	1.846 (2.16)	-0.093 (0.07)	-0.246 (0.16)	0.074 (0.05)
Loan growth	-0.00795** (0.00329)	0.00238** (0.00)	0.003 (0.00)	-0.0004*** (0.00)	0.00 (0.00)	0.00 (0.00)
Capital stringency	0.0402 (0.0791)	0.04 (0.10)	0.214 (0.18)	-0.002 (0.00)	-0.008 (0.01)	0.002 (0.00)
Activity restrictions	-0.312** (0.133)	-0.167 (0.40)	0.355 (0.27)	0.0386* (0.02)	0.145*** (0.05)	0.015** (0.01)
Supervisory power	0.0140 (0.0316)	-0.123 (0.15)	-0.286 (0.18)	-0.006** (0.00)	-0.031*** (0.01)	-0.002* (0.00)
Market discipline	0.0360 (0.0567)	0.005 (0.06)	-0.268 (0.28)	0.001 (0.00)	-0.033 (0.02)	-0.005 (0.00)
Deposit insurance	-0.365 (0.333)		-1.637 (1.11)	-0.019 (0.02)	0.008 (0.05)	0.013 (0.01)
Income level	0.00246	-1.467**	0.453	0.014	0.032	-0.033

	(0.603)	(0.58)	(0.97)	(0.01)	(0.03)	(0.02)
GDP growth	-1.355	1.151	0.245	-0.079	0.003	0.0307**
	(1.062)	(0.79)	(0.59)	(0.05)	(0.13)	(0.01)
Inflation	-0.820	1.089	11.76**	-0.086	-0.151	0.115*
	(1.317)	(1.43)	(5.82)	(0.06)	(0.22)	(0.07)
Interest	-0.508	0.333	9.733*	-0.071	-0.552*	0.0997*
	(1.072)	(2.33)	(5.13)	(0.06)	(0.31)	(0.05)
Constant	0.165			0.441**	0.695*	0.080*
	(1.29)			(0.22)	(0.36)	(0.04)
Observations	499	315	268	542	352	225
No.of banks	72	79	126	72	77	99
AR(1) (p-value)	0.04	0.16	0.29	0.22	0.28	0.06
AR(2) (p-value)	0.14	0.55	0.22	0.24	0.25	0.68
Hansen (p-value)	0.21	0.18	0.13	0.8	0.1	0.38

Notes: This table presents results based on dynamic two-step system GMM panel data estimator, as proposed by Arellano and Bond (1991) and Blundell and Bond (1998) with Windmeijer's (2005) finite sample correction. We use the lagged dependent variables as endogenous, so that 'GMM-style' instruments of deeper lags are created. AR(1) and AR(2) are the first and second order Arellano-Bond tests for serial autocorrelation and Hansen is a test of over-identifying restrictions. The tests reject the null hypotheses from second order serial autocorrelation and over-identifying restrictions. ***, ** and * indicate statistical significance at 1, 5 and 10% levels, respectively. The figures in parentheses are the heteroskedasticity-adjusted robust standard errors.

Table 7. GMM regression results of risk variables against the interaction between (A) largest ownership and bank regulations, (B) government ownership and bank regulations, and (C) foreign ownership and bank regulations

Panel A			Panel B			Panel C		
Variables	Portfolio risk	Credit risk	Variables	Portfolio risk	Credit risk	Variables	Portfolio risk	Credit risk
Ownership concentration (OC)	-0.794*** (0.29)	0.003 (0.01)	Govt. ownership	0.612** (0.30)	0.071* (0.04)	Foreign ownership	-0.277 (0.17)	-0.077 (0.10)
OC*CS	0.280 (0.31)	-0.00989* (0.01)	Govt*CS	0.046 (0.25)	0.0367* (0.02)	Foreign*CS	0.106 (0.18)	0.051 (0.08)
OC*AR	-4.421*** (1.46)	-0.039 (0.04)	Govt.*AR	1.393 (1.05)	0.216*** (0.08)	Foreign*AR	-0.900 (0.84)	-0.029 (0.19)
OC*SP	1.047*** (0.28)	-0.003 (0.01)	Govt.*SP	0.534** (0.26)	-0.102* (0.06)	Foreign*SP	-0.103 (0.21)	0.003 (0.03)
OC*MD	0.529 (0.58)	0.005 (0.01)	Govt.*MD	-0.809 (0.51)	-0.013 (0.04)	Foreign*MD	-0.190 (0.40)	0.109 (0.14)
OC*DI	3.415** (1.55)	0.039 (0.04)	Govt.*DI	0.020 (1.10)	0.023 (0.04)	Foreign*DI	1.384 (1.01)	-0.193 (0.14)
Market power	-1.294** (0.66)	-0.061** (0.03)		-0.714 (0.44)	-0.105** (0.04)		-0.885** (0.39)	0.015 (0.05)
Capital stringency (CS)	0.066 (0.05)	-0.0024** (0.00)	Capital stringency (CS)	0.106** (0.04)	0.007* (0.00)	Capital stringency (CS)	0.014 (0.04)	-0.009 (0.03)
Activity restrictions (AR)	-0.912*** (0.32)	0.004 (0.01)	Activity restrictions (AR)	-0.307* (0.16)	0.011* (0.01)	Activity restrictions (AR)	-0.527*** (0.16)	0.068 (0.05)
Supervisory power (SP)	0.210*** (0.05)	-0.004 (0.00)	Supervisory power (SP)	0.102*** (0.03)	-0.011* (0.01)	Supervisory power (SP)	0.0962*** (0.03)	-0.010 (0.01)
Market discipline (MD)	0.086 (0.10)	0.004 (0.00)	Market discipline (MD)	-0.071 (0.06)	0.002 (0.00)	Market discipline (MD)	0.008 (0.06)	-0.043 (0.03)
Deposit insurance (DI)	-0.176 (0.23)	0.003 (0.01)	Deposit insurance (DI)	-0.550*** (0.13)	-0.011* (0.01)	Deposit insurance (DI)	-0.382** (0.19)	-0.048 (0.07)
Observations	925	772	Observations	925	772	Observations	925	656
Number of bank_code1	144	115	Number of bank_code1	144	115	Number of bank_code1	144	102
AR(1) (p-value)	0.000	0.22	AR(1) (p-value)	0.000	0.20	AR(1) (p-value)	0.000	0.210
AR(2) (p-value)	0.470	0.26	AR(2) (p-value)	0.230	0.27	AR(2) (p-value)	0.620	0.360
Hansen (p-value)	0.570	0.98	Hansen (p-value)	0.510	0.99	Hansen (p-value)	0.490	0.590

Notes: This table presents results based on dynamic two-step system GMM panel data estimator, as proposed by Arellano and Bond (1991) and Blundell and Bond (1998) with Windmeijer's (2005) finite sample correction. We use the lagged dependent variables as endogenous, so that 'GMM-style' instruments of deeper lags are created. AR(1) and AR(2) are the first and second order Arellano-Bond tests for serial

autocorrelation and Hansen is a test of over-identifying restrictions. The tests reject the null hypotheses from second order serial autocorrelation and over-identifying restrictions. ***, ** and * indicate statistical significance at 1, 5 and 10% levels, respectively. The figures in parentheses are the heteroskedasticity-adjusted robust standard errors. We also include lagged dependent variables and all bank and country specific control variables in each of the specifications presented in Table 7.

Appendix A. Components of the bank regulation indices

<i>Variables</i>	<i>Descriptions</i>
Capital stringency index	This variable is determined by adding 1 if the answer is yes to questions 1–6 and 0 otherwise, while the opposite occurs in the case of questions 7 and 8 (i.e. yes = 0, no = 1). (1) Is the minimum required capital asset ratio risk-weighted in line with Basle guidelines? (2) Does the ratio vary with market risk? (3–5) Before minimum capital adequacy is determined, which of the following are deducted from the book value of capital: (a) market value of loan losses not realized in accounting books? (b) Unrealized losses in securities portfolios? (c) Unrealized foreign exchange losses? (6) Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? (7) Can the initial or subsequent injections of capital be done with assets other than cash or government securities? (8) Can initial disbursement of capital be done with borrowed funds?
Activity restrictions index	The score for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities (2) insurance activities (3) real estate activities (4) bank ownership of non-financial firms. These activities can be unrestricted, permitted, restricted or prohibited that are assigned the values of 1–4, respectively. We use an overall index by calculating the average value over the four categories.
Supervisory power index	This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each one of the following fourteen questions: (1) does the supervisory agency have the right to meet with external auditors to discuss their report without the approval of the bank? (2) Are auditors required by law to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (3) Can supervisors take legal action against external auditors for negligence? (4) Can the supervisory authorities force a bank to change its internal organizational structure? (5) Are off-balance sheet items disclosed to supervisors? (6) Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? (7) Can the supervisory agency suspend director's decision to distribute dividends? (8) Can the supervisory agency suspend director's decision to distribute bonuses? (9) Can the supervisory agency suspend director's decision to distribute management fees? (10) Can the supervisory agency supersede bank shareholder rights and declare bank insolvent? (11) Does banking law allow supervisory agency or any other government agency (other than court) to suspend some or all ownership rights of a problem bank? (12) Regarding bank restructuring and reorganization, can the supervisory agency or any other government agency (other than court) supersede shareholder rights? (13) Regarding bank restructuring & reorganization, can supervisory agency or any other government agency (other than court) remove and replace management? (14) Regarding bank restructuring & reorganization, can supervisory agency or any other government agency (other than court) remove and replace directors?
Market discipline index	This variable is determined by adding 1 if the answer is yes to questions 1–7 and 0 otherwise, while the opposite occurs in the case of questions 8 (i.e. yes = 0, no = 1). (1) Is subordinated debt allowable (or required) as part of capital? (2) Are financial institutions required to produce consolidated accounts covering all bank and any non-bank financial subsidiaries? (3) Are off-balance sheet items disclosed to public? (4) Must banks disclose their risk management procedures to public? (5) Are directors legally liable for erroneous/misleading information? (6) Do regulations require credit ratings for commercial banks? (7) Is an external audit by certified/licensed auditor a compulsory obligation for banks? (8) Does accrued, though unpaid interest/principal enters the income statement while loan is non-performing?
Note: We follow among others Agoraki et al (2011) in constructing these indices.	

Appendix B: The process of calculating the Lerner Index:

Lerner Index, $LI_{it} = \frac{P_{it} - MC_{it}}{P_{it}}$, where P_{it} is the price of bank production measured the ratio of total revenues (interest and non-interest income) to total assets for bank i at time t , and MC_{it} is the marginal cost for bank i at time t . Marginal cost is based on following translog cost function with one output (Q) and three input prices ($W1$, $W2$ and $W3$):

$$\begin{aligned} \ln Cost_{it} = & a_0 + a_1 \ln Q_{it} + \frac{\alpha_2}{2} \ln Q_{it}^2 + \sum_{k=1}^3 \gamma_{kt} \ln W_{k,it} + \sum_{k=1}^3 \beta_k \ln Q_{it} \ln W_{k,it} + \\ & \sum_{k=1}^3 \sum_{j=1}^3 \ln W_{k,it} \ln W_{j,it} \end{aligned} \quad (1)$$

where Q = Total assets

$w1$ = Price of labor (the ratio of personal expenses to total assets)

$w2$ = Price of physical capital (the ratio of non-interest expenses to fixed assets)

$w3$ = Price of borrowed funds (the ratio of paid interest to total funding)

The marginal cost is derived as:

$$MC_{it} = \frac{Cost_{it}}{Q_{it}} \left[a_1 + a_2 \ln Q_{it} + \sum_{k=1}^3 \beta_k \ln W_{k,it} \right] \quad (1)$$

Eq.(1) is estimated using fixed effect model for the whole panel of banks, since some countries have small sample size (see also Agoraki et al. 2011), and thus provided statistically insignificant results. The Lerner index ranges from 0 to 1, with 0 indicating no market power of the bank (perfect competition) and 1 indicating the monopoly condition, where banks charge higher mark-up price over marginal cost (e.g., higher market power of the bank).