

The Influence of Competition on the Financial Stability of Banks in the Gulf Cooperation Council Countries

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Abstract

This paper tests the average relationship between competition and bank stability for 70 banks operating in the Gulf Cooperation Council Countries during the period 2001-2011. Our results show that an increase in competition contributes to bank fragility and that its contribution depends on the strength of regulations. In particular, the impact on bank soundness will be stronger the lower the capital requirements, the weaker the supervisory power, the stricter the regulations imposed on bank activities, and the less transparency and market discipline. These findings carry important policy implications for banks' stability in the Gulf Cooperation Council Countries.

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1. Introduction

Over the last decade the Gulf Cooperation Council countries (the GCC hereinafter) have undergone substantial reforms that aimed to promote banks competition and stability.¹ These reforms opened up the banking market for new entrants, and removed barriers to investment in the financial sector. It also liberated trade in financial services, strengthened banking regulations and supervision, imposed compliance with Basel Accords, and removed controls on interest rates. These measures were expected

¹ The GCC countries include the following countries: Bahrain, Kuwait, Qatar, Saudi Arabia, and the UAE.

to promote competition among banks, with positive influence on financial system soundness and stability.

The impact of competition on bank stability is controversial. Though it may have a positive influence through financial depth, growth and efficiency; fierce competition could also lead to excessive risk taking activities and hence, it may end up unintentionally threatening financial stability. Thus, it is important to investigate the competition-stability relationship in the evaluation of banking sector deregulation in the GCC, and this is the objective of the paper. In particular, our aim is to provide additional insights into the influence of market structure on bank risk-taking behavior and financial stability. Our sample is comprehensive and contains all the 70 banks operating in the GCC during the period that extends from 2001-2011.

Similar inconclusive empirical evidence also characterizes the relationship between regulatory variables and financial stability. For instance, on one hand, capital requirement and restrictions on bank activities may foster stability (Hellmann et al. 2000); on the other hand, they might lead to less diversification, rent seeking activities, and higher funding cost and hence, less stability (Barth et al. 2004; Carletti, 2007; and Agorak et al. 2011). The role of the supervisory power may also depend on the strength of the supervisor in influencing banks' risk taking behavior. If supervision is weak, banks may assume additional risks that ultimately threaten stability. However, a weak supervisor may enhance the charter value of banks, thus leads to less risk activities and more stability (González, 2005). Thus, another objective of this paper is to assess the influence of regulations on GCC banks stability. Specifically, we focused on the influence of four regulatory dimensions: capital requirement, restrictions on activities, power of the supervisor and market discipline.

In the recent empirical literature, the relative importance and strength of the competition stability relationship depends on the regulatory framework in which banks operate (see, e.g., Beck et al. 2012). The evidence on the influence of regulations on the nature of the relationship is contradicting as well. For instance, adverse consequences of low competition on systemic stability are more serious in

countries with weak supervision and less restrictions on bank activities (see, e.g., Anginert et al. 2012; and Fernández et al. 2013). On the contrary, market power is good for stability and it becomes even better in countries with stricter regulations on bank activities and stronger supervisory power (see, e.g., Agoraki et al. 2011; and Beck et al. 2012). Therefore, in this paper, we account for the interaction between regulatory variables and competition in influencing stability of GCC banks.

While the literature on competition-stability relationship is voluminous, our paper, to the best of our knowledge, is the first to explore these inter-relationships for GCC banks. In that sense, we add to the international evidence an additional insight from a region that has not been checked before, and is going now under substantial reforms aiming to deregulate banks and to improve competition. Therefore our results are relevant, and contribute to the current debate in these countries on the role of competition and regulations in promoting bank stability. Specifically, we shed lights on three related issues: first we assess the relative likelihood of competition-stability hypothesis, against competition-fragility hypothesis in GCC banks. Second, we check in the influence of regulatory framework on bank stability. Third, we assess how regulation and competition interact to influence bank stability.

Our results show a significant non-linear association between market power, as measured by the Lerner Index, and bank's stability computed as the Z-Score. In particular, as bank market power increases, so will its stability; but up to a certain threshold, at which the relationship reverses, and additional power reduces stability instead. This indicates that the relationship between market power and stability could go either way, depending on the initial level of the bank market power. However, for most of the banks in the GCC, the market power lies below the inflection point estimated in the model, and thus we can conclude safely that power is good for stability of GCC banks.²

Therefore, banks gaining market power in the GCC are less likely to fail, and policies implemented to promote competition may have the unintended outcome of reducing bank stability. From the recent

² The recent works of Martinez-Miera and Repullo (2010) and Hakenes and Schnabel (2011) show that under the assumption of imperfect default correlations, the relationship between risk and competition are U shaped. Thus, the relation can go either way depending on other factors and the level of competition.

cross country studies, we are consistent with Berger et al. (2009), Turk-Ariss (2010a), Jiménez et al. (2010), Agoraki et al. (2011) and Beck et al. (2012). But, we stand opposite to De Nicoló et al. (2004), Boyd et al. (2005), Schaeck et al. (2009), Schaeck and Cihák (2012), Liu et al. (2012), and Soedarmono et al. (2013). These studies found that banks' risk taking activities increases as market power increase, and thus, indicated a positive impact of competition on stability. All these works have used the Lerner Index and the Z-Score as proxies for market power and bank stability respectively.

The empirical evidence from the sample also points out a significant positive association between bank stability and the regulatory environment. GCC banks are more stable, the more stringent the capital requirement, the stricter the regulations on bank activities, the stronger the supervisory power and the higher private monitoring and market discipline. However, the parameters associated with the interaction variables between the market structure and the regulatory variables were negative and significant indicating that regulations are more effective when market power is low. Similarly, these results indicate that the influence of competition on bank instability might be mitigated by a stricter regulatory environment. It also indicates that the positive influence of market power on stability could be hampered by strict regulations.

The rest of the paper is organized as follows. Section 2, we review a synopsis of the recent literature on bank stability. In Section 3, we provide background information on GCC banking markets. We describe the data set, the explanatory variables and the methodology in Section 3. The empirical results are contained in section 4. Finally, section five includes some concluding remarks.

2. Literature Review

The impact of competition on bank stability is a debatable issue.³ Though bank competition may have a good influence on prices and quality of financial services (Boyd and De Nicoló, 2005), financial depth (Dick and Lehnert, 2010; and Rice and Strahan, 2010), income distribution (Beck et al. 2010),

³ See the surveys by Carletti and Hartmann, (2003), Carletti (2008) and Degryse and Ongena (2008) for comprehensive reviews of competition-stability relationship studies.

growth (Catorelli and Gambera, 2001) and efficiency (Bertrand et al. 2007); it may still negatively impact bank stability. This competition-fragility relationship could be explained by the charter value view of banking as in Marcus (1984) and Keely (1990). The view assumes that banks decide over the risk level of their portfolios depending on bank profits, capital and reserves. When competition is high, reserves and profits are low and thus, banks are tempted to assume excessive risks, as these are shifted to depositors by the virtue of limited liability and the low level of hurt money.⁴ These excessive risks lead to bank fragility. On the contrary, when entry is restricted and competition is limited, banks have substantial profits and capital cushions and therefore, fewer incentives to take excessive risk, and hence, its behavior contributes to bank stability (See Boot and Greenbaum, 1993; Matutes and Vives 2000).

Moreover, monitoring is more efficient when the number of banks is low. The effective supervision may reduce the chance of systemic distress and enhance financial stability (Allen and Gale, 2000). In these concentrated systems, banks also earn informational rents from their long relation with clients, and this increases their incentive to screen loan applications, thus reducing adverse selection and helping to underwrite good quality assets, with positive repercussions on stability (Allen and Gale, 2000, 2004, Boot and Thakor, 1993; and Allen et al. 2011).

The cross country empirical evidence on the competition–fragility relationship suggests that concentrated banking systems are less likely to suffer from banking crisis as opposed to competitive systems. The evidence along this line is substantial, and can be found in Marcus (1984), Keeley (1990) and Demsetz et al. (1996). From the recent empirical literature there is also the works of Hartmann (2002), Carletti and Hartmann (2003), Beck et al. (2006), Beck (2008), Berger et al. (2009), Schaeck et al. (2009), Jiménez et al. (2010), and Wagner (2010).

As opposed to the fragility theory, the competitions–stability hypothesis, argues that more competition leads to more rather than less stability. Specifically, Boyd and De Nicoló (2005) show that

⁴ The hurt money here describes the bank loss due to the investment decision.

increased lending rates in less competitive markets raises entrepreneurs' cost of borrowing and induce them to assume greater risks, and this should necessarily increase default rates and reduce bank stability.⁵ The recent extensions to Boyd and De Nicoló (2005), which assumes imperfect default correlations have also shown that the competition–stability relationship might be non- linear and U shaped and hence, an increase in competition may increase or decrease stability depending on the initial level of competition and other relevant factors (Martinez-Miera and Repullo, 2010; and Hakenes and Schnabel, 2011).

Other arguments in support of the competition–stability relationship is that market power increases systemic risk, through bad credit rationing and more concentrated lending of large sums of money (Caminal and Matutes, 2002). Moreover, the “*too big to fail*” argument that shape the public intervention decision in bailing out troubled firms induces banks to assume excessive risks as the final loss lies will eventually be compensated by tax payers' money. In these circumstances, moral hazard is substantial and this raises systemic risk, and increases financial instability (Mishkin, 1999). From the recent cross country studies, the support for the competition–stability hypothesis could be found in Boyd and De Nicoló (2005), Boyd, et al. (2006), Schaeck et al. (2009), Schaeck and Cihák (2011), Deniz et al. (2012), and Liu et al. (2012).

The recent works has pointed out that the nature and extent of association between competition and stability relationship depend on the regulatory environment. Some regulations may limit the extent to which banks may assume risks, when its charter value declines. This in turn affects the competition–stability relationship. For instance, competition adversely affects stability by more when supervision is weak and there are few restrictions on bank activities (Anginer et al. 2012). Similarly, the positive influence of market power on stability is greater when there are a lot of restrictions on bank activity and when the supervisory is strong (Agoraki et al. 2011; and Beck et al. 2012). Moreover, from the

⁵ There is also evidence that banks in competitive banking sectors hold more capital. One reason might be that these banks want to compensate for the additional risk they are assuming in a competitive environment

literature that advocates the competition–stability hypothesis, Fernández et al. (2013) found that the economic adverse influence of market power is greater when supervision is weak.⁶

Most studies on bank stability have focused on US and EU banks (Keeley, 1990; Demsetz et al. 1996; Gan, 2004; Schaeck et al. 2006; Beck et al. 2006, Uhde and Heimeshoff, 2009; and Liu et al. 2012).⁷ However, there was an increased attention to studying bank stability in the aftermath of the East Asian and the Latin American financial crises in late 1990s. For instance, Levy-Yeyati and Micco (2007) and Tabak et al. (2012) have investigated stability in Latin America. Agoraki et al. (2011) studied financial stability in Eastern Europe. Berger et al. (2009) and Turk-Ariss (2010a) focused on a group of developed and developing banking systems. Finally, Nguyen et al. (2012) and Soedarmono et al. (2013) studied stability in Asian countries. There was, however, no empirical study on the association between market structure and bank stability in the GCC. This paper is intended to fill this gap. We turn to discuss some background information on the GCC banking market.

3. The GCC Banking Market

The banking sector in the GCC is dominated by a few domestic banks. In all countries the largest three banks control from 49%-71% of the total banking sector assets (See Table 1). The non-bank financial institutions are limited, and they are either owned by banks or rely heavily on bank financing. Thus, the risk of the whole financial activities of these may ultimately be borne by banks. The insurance sector is small, and it only focuses its operation on property and casualty risks. Contractual savings are also limited to a small number of defined benefit plans that contribute marginally to the accumulation of long term assets and investment. The pension plans' assets are below 5% of the GDP in most of the GCC countries.

INSERT TABLES 1 ABOUT HERE

⁶ On the direct effect of regulations on bank stability, see Bath et al. (2004, 2006)

⁷ The empirical studies from specific countries are inconclusive as to the role of competition on bank stability.

The banking market in the GCC is dominated by large banks, which are owned largely by quasi-public entities. For instance, 50% of the banking sector is owned by the Government in the UAE, 30% in Oman, and 35% in Saudi Arabia. Foreign ownership is restricted by certain limits. These limits include the GCC banks as well. Therefore, the presence of non-national banks is mostly limited to branches, and in some cases only a single branch. This reflects high entry barriers and tough licensing restrictions imposed on foreign banks. Despite that, foreign banks share of total assets is large and significant especially in Bahrain and Oman. The total assets controlled by foreign banks in these locations are 56% and 30% respectively. The shares in other countries are still small, 13% in Saudi Arabia, 3.7% in Qatar, and 11% in and Kuwait.

Due to barriers of entry, cross border joint ventures are also relatively low. The partnerships with foreigners in the Saudi domestic banking sector are small, and it includes foreign investors from outside the GCC. The situation is the same in Kuwait and the UAE, as joint ventures are negligible. The exception is the Omani banking sector, where there exists strong ventures with foreign investors; however, these are mainly investors from the other GCC countries.

Following the big increases in oil prices during the last decade, the level of banking sector intermediation has increased. The credit provided by banks grew at unprecedented levels. For example, the growth rate during that period was 45% and 35% in Qatar and UAE respectively. Similarly, rates in the remaining countries were also substantial, as credit grew by more than 20% on annual basis. This reflects an increase in risk taking behavior and instability of GCC banks. The exposure of banks to the performance of the macro economy has jumped to high levels in the run up to the global financial crisis. The banking sector becomes more vulnerable to cyclical down turns in economic activity.

The banking sector in the GCC is traditional. It mainly finances domestic loans by raising domestic deposits. Foreign financing is limited. The interbank domestic market provides an additional important source of financing. The long term financing through bond issuance is limited and thus, the system vulnerability to a potential mismatch between assets and liabilities is high. Assets are mainly composed

of loans, Islamic financial products, and some security investments. The proportion of loans and Islamic products is substantial. For instance, it is 50% and 71% in Saudi Arabia and the UAE respectively. On the contrary, banks invest in securities to a lower extent. The weight of securities to total assets is 8% in Qatar and 23% in Saudi Arabia. Following the financial crisis, banks in the GCC have realized significant losses due to loan defaults and as their trading portfolios were marked to market.

The household lending in the GCC countries concentrate on salaried individuals, and this may reduce the risk of lending. However, risks of massive layoffs remain substantial, particularly in an economic downturn.⁸ Another trend in the GCC is lending for equity investment, and facilitating equity margin purchases. This in turn exposes banks to market induced credit risk.

The banks in the GCC are well capitalized by international standards, and they are the best capitalized among emerging markets. The capital blanket is well above the 8% of risky weighted assets required by Basel II. The best capitalized banking sector is the UAE, followed by the Bahrain banking sector, with capital adequacy ratios of 21.8% and 20% respectively.⁹ However, the rapid credit growth, the increased leverage in recent years, as well as the drop in profitability in the aftermath of the financial crisis have severely impaired the ability of banks to raise capital internally. Moreover, there are substantial potential risks in the horizon, and as the current financial crisis continues to unfold.

The GCC banking sector was highly regulated until the mid-1990s. The government has even regulated the price of credit and interest rates. However, in the last decade, most regulations and constraints have been gradually removed, including those related to interest rates. On the other hand, the GCC countries have amended the banking regulations to include corporate governance-related standards regarding transparency, and required disclosures in bank financial statements. The new regulations also required the establishment of board level audit, nomination and compensation

⁸ These countries have also started to implement policies to nationalize jobs. These programs occasionally may lead to massive layoffs. This increases in the chances of default.

⁹ It could be well possible that these banks are holding more capital to compensate for the higher risks they are taking

committees, and called for improved risk management, and Basel II compliance. These requirements enhanced intermediation. Despite these significant reforms, still restrictions remained on a number of important issues. For instance, in several countries, there are still restrictions on entry, the payment of dividends to shareholders, and on the remittances of profits by foreign investors.

The threats ahead are still large. The risks are big in countries that have experienced a high rate in credit growth, and it is also high in regions that are characterized by concentrated bank portfolios in construction and real estate. The concentration of credit in large business groups is also another worry as indicated by the recent default of two prominent Saudi conglomerates. Many banks in the GCC had significant exposures to these companies. Moreover, Dubai's debt is another issue, where many financial institutions in the GCC have big exposures to the government of Dubai and its affiliated holding and other companies. Hence, it would be important to assess how competition and regulations affect GCC bank stability.

4. Methodology and Data

3.1 The Empirical Model

The competition-stability relationship is investigated using a dynamic panel model that can be written as:

$$ST_{i,j,t} = \beta_0 + \beta_1 ST_{i,j,t-1} + \beta_2 MP_{i,j,t} + \beta_3 MP_{i,j,t}^2 + \beta_4 Reg_{j,t} + \beta_5 MP_{i,j,t} * Reg_{j,t} + \beta_6 BS_{i,j,t} + \beta_7 EC_{j,t} + \beta_8 D_t + \varepsilon_{it}, \quad \varepsilon_{it} = v_i + u_{it}, \quad i = 1, \dots, N; j = 1, \dots, M = 1 \quad (1)$$

In this specification, the indices $i; j; t$ stand respectively for bank, country and time. $ST_{i,j,t}$ is a stability measure that could either be the z-score or non-performing loans. To capture any persistence in bank stability, we included its first lag as an explanatory variable in (1). The market power of an individual bank is represented by $MP_{i,j,t}$. Its quadratic term $MP_{i,j,t}^2$ was included to allow for any non-linearity in the relationship between stability and market power. The variable $Reg_{j,t}$ is intended to capture the influence of the regulatory framework, which is measured here using four indices: capital

requirements, restrictions on bank activities, supervisory power and market discipline. The influence of regulations on the impact of market power on bank stability is inferred by including the cross product of each of the four regulatory dimensions with market power as an independent variable in (1).

Finally, the model controls for a group of other relevant variables. The vector of bank specific variables, $BS_{i,j,t}$ characterizes the business model of individual banks. In particular, we include size, ownership, cost efficiency, diversification and capitalization. The $EC_{j,t}$ variable controls for varying macroeconomic environment. Finally, D_t is a dummy that capture the influence of the 2007-2008 financial turmoil. The disturbance term, ε_{it} includes a country fixed effect v_i , and an identically and independently distributed idiosyncratic error term u_{it} . The measurement and selection of variables is explained in the next subsection. A detailed description of these variables is included in Table 2.

To estimate (1), we used a two-step generalized method of moments approach.¹⁰ This estimator is robust to any possible endogeneity by selecting the most appropriate instruments. A Sargan test indicated the validity of the used instruments, as we failed to reject the null of correct specification. The diagnostic of the model also indicates that errors are not serially correlated. Thus, we conclude that the model used is appropriate to make inference and that the GMM generated estimates are consistent.

3.2 Variables Description and Measurement

3.2.1 Financial Stability

To proxy bank stability we used an intuitive measure, namely the Z-Score that computes distance to solvency. The measure is calculated as the number of standard deviations that bank's return on assets may fall before the bank becomes insolvent (Roy, 1952).¹¹ Specifically, the Z-Score is computed as

$$\frac{\overline{ROA}_{i,j,t} + CAP_{i,j,t}}{\sigma_{ROA_{i,j,t}}}$$

¹⁰ It is a system-GMM consistent estimator as in the Arellano and Bover (1995) and Blundell and Bond (1998).

¹¹ We also measure stability with the ratio of non-performing loans to net loans (NPLs hereinafter). The NPLs measure is more related to ex-post credit risk.

where $\overline{ROA}_{i,j,t}$, is the return on asset, $CAP_{i,j,t}$ denotes the equity asset ratio, and $\sigma_{ROA_{i,j,t}}$ is the standard deviation of return on assets. A three year rolling window is used to compute $\sigma_{ROA_{i,j,t}}$ rather than the full sample period to enable the score to be driven by the volatility of the return on asset and not only by banks profitability and changes in capital levels. The Z-Score is higher, the wider the equity base, the more profits the bank generates and the more certain these profits are. A higher z-score implies a lower chance of insolvency and thus, higher stability. As the Z-Score is highly skewed we used the natural logarithm of score to correct and smooth out large values.¹² Panel A of Table 2 displays a summary statistics of the inputs used to compute the z-score.

3.2.2 Bank Market Power

The bank-level market power is estimated by the Lerner Index indicator. The Lerner index measures bank's profitability that can be attributed to pricing power and its computation is based on individual bank data of each country.¹³ Hence, it can overcome the problem of small-sample bias (Jeon et al. 2011). The measure also allows for bank heterogeneity (Claessens and Laeven, 2004; and Brissimisa and Delis, 2011). We compute the Lerner index for each bank i at year t as the distance between the price and the marginal cost, and it is defined as:

$$Lerner_{it} = \frac{P_{it}^q - MC_{it}}{P_{it}^q} \quad (2)$$

where P_{it}^q , and MC_{jt} are the price of output, and marginal cost respectively. The marginal cost is derived by from a translog frontier cost function. In that function, the total costs depend on the prices of three inputs: labor, fixed assets, and funds. It also depends on the trend and the bank's output as

¹² We compute the natural logarithm of the Z-Score to proxy stability as in Demirguc-Kunt and Huizinga (2010), Laeven and Levine (2009), Agorakiet et al. (2011), Beck et al. (2012) and many others.

¹³ Market power can be also measured by Herfindhal Hirschman Index (HHI), or Panzar–Rosse H statistics. The HHI, however, is ambiguous and misleading indicator as it ignores the relationship between market contestability and revenues at the bank-level (see, e.g., Berger et al. 2009; and Beck et al. 2012). On the other hand, Panzar–Rosse H statistics requires banking markets to be in long-run equilibrium, which is not always the case in practice (Berger et al. 2009).

measured by its total earning asset. Specifically, we used the bank-level panel data for each country to estimate the following Trans log cost function:

$$\begin{aligned}
\ln C_{it} = & \alpha_0 + \alpha_1 \ln q_{it} + \frac{1}{2} \alpha_2 \ln(q_{it})^2 + \sum_{k=1}^3 \beta_{kt} \ln W_{k,it} + \frac{1}{2} \sum_{k=1}^3 \sum_{j=1}^3 \beta_{k,jt} \ln W_{k,it} \ln W_{j,it} \\
& + \frac{1}{2} \sum_{k=1}^3 \delta_k \ln q_{it} \ln W_{k,it} + \mu_1 Trend + \frac{1}{2} \mu_2 Trend^2 + \mu_3 Trend \times \ln q_{it} \\
& + \sum_{k=1}^3 \rho_k Trend \times \ln W_{k,it} + \tau_{it}, \quad \tau_{it} = \omega_i + \zeta_{it}
\end{aligned} \tag{2}$$

where C_{it} is the total cost (financial and operating) of bank i at time t . Note that q_{it} represents a proxy for bank output or total assets. The three input prices, $W_{1,it}$, $W_{2,it}$, $W_{3,it}$ are respectively, the price of labor, the price of fixed assets, and the price of borrowed funds. The price of labor is measured as the ratio of personnel expenses to total assets.¹⁴ The ratio of operating expenses (net of labor cost) to fixed assets is used to proxy the price of fixed assets. The interest expense to total deposits was used to compute the price of borrowed funds. Panel B of Table 2, shows a summary statistics of these variables. We include time dummies (*Trend*) to capture improvement in technology, as well as any effects of omitted trending variables. The disturbance term τ_{it} includes an unobserved bank specific effect ω_i , and an idiosyncratic error term ζ_{it} . The equation in (3) is estimated using the Generalized Method of Moments.¹⁵ Once estimated, the marginal cost may be obtained by take the first derivative of the dependent variable with respect to output q_{it} (total assets) as follows:

$$MC_{it} = \frac{\partial C_{it}}{\partial q_{it}} = \frac{C_{it}}{q_{it}} \left[\alpha_1 + \alpha_2 \ln q_{it} + \sum_{k=1}^3 \beta_{kt} \ln w_{k,it} + \mu_3 Trend \right] \tag{4}$$

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3.2.3 Regulatory variables

¹⁴ A better measurement of labor price is the ratio of personnel expense to the number of bank employees. Unfortunately, BankScope does not include comprehensive information on the number of bank employees for the GCC countries.

¹⁵ We correct for simultaneity bias by using instrumental variables.

The regulatory environment is summarized by four indices; capital requirement, the official supervisory power, market discipline, and activity restrictions. These are obtained ready from the World Bank database. The World Bank database was developed by Barth et al. (2001, 2006, and 2008). Each index corresponds to one of the regulatory variables, and its value was measured by summing the number of positive answers (or negative answers) to a pre-defined relevant qualitative question set. The question set describes the various dimensions of the related variable.

The index of capital requirement measures the degree to which banks have regulatory restrictions on the amount of required capital. The official supervisory power index reflects the extent to which a country's supervisory authority has the power to take corrective actions in banking decisions. The market discipline index is related to the effectiveness of private supervision to monitoring banks.¹⁶ Finally, the activity restrictions index measures the extent to which banks are subject to regulatory restrictions on securities trading, insurance business and real estate activities. Additional information on the computation of these indices is available from the World Bank Website.¹⁷

3.2.4 Other Controls

We also control for a number of other variables to reduce the omitted variable bias. In line with the literature¹⁸, we include a variety of bank-, and country-specific control variables. At the bank level, we control for bank size, cost efficiency, diversification, and capitalization. We used the natural logarithm of real total assets to represent bank size; the ratio of total cost to total income as a measure of cost

¹⁶ It captures whether an external audits, the transparency of financial statements and the credit-rating evaluations by rating agencies are required by supervisory agencies.

¹⁷ The number of questions that describe the capital requirement, the power of supervisory agencies, the market discipline and the restriction on activity indices is 9, 14, 10, and 16 respectively. Hence, the capital requirement may assume values from 0 to 9, the power of the supervisory agencies from 0 to 14, the market discipline from 0 to 10, and finally the activity restrictions from 0 to 16.

¹⁸ These variables were controlled for by Bath et al. (2004), Turk-Ariss (2010a), Houston et al. (2010), Agoraki et al. (2011), Beck et al. (2012), Nguyen et al. (2012), Tabak et al. (2012), Liu et al. (2012), Louzis et al. (2012), Soedarmono et al. (2013), among many others.

efficiency; the ratio of non-interest income to total operating income as a measure of diversification (as in Leaven and Levine, 2007); and the equity to assets ratio for capitalization.¹⁹

We control for cross-country differences in ownership structure using the following two variables: the degree of foreign ownership, and the degree of government ownership. These were measured as the fraction of the banking system's assets that are 50% or more government owned, and the fraction that is 50% or more foreign owned respectively.²⁰ In addition, we control for the general economic conditions by including real GDP growth and inflation rates. The GDP growth is used as a proxy for the phase of business cycle. Finally, we include a crisis dummy variable to capture the global financial crisis in (2007–2008).

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3.3 Data Set and Summary Statistics

The sample is composed of annual observations that cover all GCC banks. The bank data set was obtained from Bank Scope database provided by Fitch-IBCA.²¹ In the sample, we include all the commercial banks in the database that have eleven years of data available between 2001 and 2011. The filtered sample contains 70 banks: 13 banks in Bahrain, 11 in Kuwait, 8 in Oman, 8 in Qatar, 10 in Saudi Arabia and 20 in UAE. All data were deflated with the consumer price index to convert into real, in constant 2001 dollars. As mentioned previously, the data on regulation indices was obtained from the World Bank databases on Bank Regulation and Supervision.²² In particular, we get the indices for 2001 by using the 2001 database, and we obtain it for the years 2001-2005, from the 2003 database, and finally for 2006 to 2011, from the 2007 database. The data for the GDP growth was collected from the International Financial Statistics of the International Monetary Fund.

¹⁹ The bank's off-balance-sheet activity may also affect its risk-taking and stability (Delis and Kouretas, 2011). However, the BankScope database does not provide information on off-balance-sheet items for GCC banks. This limits our ability to consider the influence of off-balance-sheet items on bank stability.

²⁰ The ownership data is obtained from the World Bank database by Barth et al. (2001, 2006, and 2008).

²¹ IBCA stands for the International Bank of Credit Analysis Ltd.

²² The world bank databases includes three versions: the 2001 version, the 2003 version and the 2007 version. The data is available at <http://go.worldbank.org/SNUSW978P0>.

Table 4 reports the mean and the standard error of each of the variables used in the model. The table shows that the explanatory variables significantly differ among individual countries. The average ratio of non-performing loans to total loans was 8.26% for the whole of GCC banks. Its country value ranges from 4.90% to 10.03% in Oman and Bahrain respectively. The relatively high ratio of non-performing loans points to the poor quality of underwritten loans in the GCC countries. This may be confirmed by the logarithm of the Z-Score, which indicates higher risk compared to developed, developing and transitional economies. The average Z-Score stands at 1.66% for the whole region, which is lower than that observed in either transitional or developing countries.²³

The Lerner index computations show that the banking market in the GCC is not competitive. Its average for GCC banks was 46.85%. However, it has also exhibited a significant variation that ranges from 30.67% in Qatar to 66.22% in Bahrain. Figure 1 presents the time series graphs of the Lerner index. The figure shows that bank competition has improved in all countries except Bahrain. These results conform to the recent evidence recorded by Al-Muharrami et al. (2006), Turk-Ariss (2010b) and Anzoategui et al. (2010) who also reported a weak competition in developing countries' banks. The figures also show that the recent global financial crisis led to a significant decrease in the average Lerner index for most of GCC banks until 2010. Therefore, we can conclude that the slowing demand on banking services in the aftermath of the 2007-2008 financial crises has increased competition among banks.

Table 4 also includes the indices used to proxy the regulatory environment. These indices show some variation across countries. The capital requirement index ranges between 3.67 to 6.73 for Bahrain and Oman respectively. Thus the capital requirement is relatively more stringent in Oman than in Bahrain.²⁴ The supervisory power and the market discipline indices were relatively similar across countries. However, the activity restrictions index showed that the banking activities in countries like

²³ These scores are significantly lower than those obtained by Casu and Girardone (2009), Turk-Ariss (2010a), Agoraki et al. (2011), and Liu et al. (2012).

²⁴ The average for the whole region is 5.09.

Qatar and Oman are more restricted, when compared to either the UAE, or the whole of the GCC region.

The ownership structure is also reported in Table 4. The numbers show that 20.3% of the banking sector in the GCC is owned by foreigners. During the period of the study, foreign ownership was as follows: 60.7% in Bahrain, 27% in the UAE, 15.3% in Oman, 10.35% in Saudi Arabia, 7.45% in Qatar, and there was no foreign owned banks in Kuwait. Table 4 also shows that 16.1% of the GCC banking sector is owned by governments. The government ownership across countries was 45.1% in Qatar, 35% in the UAE, 13.7% in Saudi Arabia, and 2.8% in Bahrain. There were no banks owned by the government in Oman and Kuwait.

INSERT TABLE 4 ABOUT HERE
INSERT FIGURE 1 ABOUT HERE

The correlation matrix in Table 5 shows that the Lerner Index is positively correlated with the Z-Score and negatively correlated with NPLs. Thus, the preliminary investigation of simple correlations indicates that market power enhances bank stability. Less competition is associated with less credit losses, more solvent banks and hence, higher stability. Moreover, the Z-Score is positively correlated with all regulatory indices (the NPLs is negatively correlated). Therefore, regulations that impose a stringent capital requirements, limits banking activities, supervise closely and enhances private monitoring is improves bank stability.

Note that except for the correlations with the Z-Score and the NPLs; all other cross correlations among independents are weak indicating that the chosen explanatory variable constitutes independent sources of information.²⁵ Finally, the high correlation between the Z-Score and the NPLs indicates that the two measures are good substitutes to proxy bank stability in GCC banks.

INSERT TABLE 5 ABOUT HERE

²⁵ It also indicates that inference on significant variables will not be contaminated by multicollinearity. In this context, Kennedy (2008) pointed out a severely biased inference may be drawn when correlations exceed 0.8. We also checked for multicollinearity by performing a variance inflation factor (VIF) test suggested by Belsley et al. (1980). Our VIF tests (available upon request) indicates that the correlation between explanatory variables do not pose a serious multicollinearity for the purpose of estimation.

5. Empirical Results

Table 6 presents the estimation results for four specifications that are nested in the generic formulation in (1).²⁶ In all models, we used the bank-level Z-Score and the Lerner index to proxy bank stability and market power respectively. The independent variables were all lagged by one period to check their predictability.²⁷ These models were estimated using 11 years of data for each of the 70 banks in the sample. Any potential endogeneity in the variables were accounted for by using lagged and first-differenced values of the same variables as instruments.²⁸ Table 7 contains the results when the NPLs is used to proxy bank stability. As the results are exactly similar for the both measures, we concentrate the bulk of the analysis on Table 6.

Table 6 shows that the coefficient of the lagged Z-Score is positive and statistically significant. This indicates that stability persists to a moderate extent. Columns 2 and 4 of Table 6 show that the parameter associated with the Lerner index is positive for the linear term, but negative for the quadratic term. Both of these coefficients are statistically significant at the 1% level. Thus, the estimated models suggest that the market power stability relationship is nonlinear and concave. In particular, banks with low and high market power are the least stable, and the most likely to be insolvent in the future. However, banks with an average market power tend to assume less risk and hence, they appear to be relatively more stable. This non-linear effect is presented in Figure 2, Panel A. In order to determine the nature of the relationship in GCC banks, we computed the inflection point of models 2 and 4 in Table 6, and compared it with the distribution of the data. The inflection point of was 2.596 and 2.413 for models 2 and 4 respectively. These points only covers the 1st percentile of the Lerner index distribution of GCC banks. This implies that more than 99% of market power data lies below the

²⁶ We estimated also a two-stage least squares (2SLS). However, results were not any different. These results are only available from authors upon request.

²⁷ At two lags, the statistical significance of the variables drops severely.

²⁸ As can be seen in Table 6, the Sargan test does not reject the null of suitable instruments and specification. Moreover, the lack of second-order serial correlation in the residuals provides further support for the models.

inflection point. Thus, we conclude that market power is more likely to have a positive effect on GCC bank stability.

As mentioned previously, our results are robust to the choice of the stability proxy. For example, in Table 7 we used the nonperforming loans to total loans (NPLs) instead of the Z-Score to proxy bank stability. As can be seen in the table (models 2 and 3); while the parameter associated with market power is negative and significant, the parameter associated with the quadratic market power is positive.²⁹ The inflection point of this convex relationship was estimated to be around 3.85. However, as the empirical distribution of the computed market power indicates that 99.5% of GCC banks lies above this threshold, we conclude that the association between market power and NPLs is negative. Thus, an increasing competition may induce banks to write bad loans in the credit market with significant repercussions on their stability (see, e.g., Bergstresser, 2008).

Overall the above results suggest that an increase in banking market power has a positive impact on financial soundness. Thus, we may conclude that the competition-fragility hypothesis is more likely to prevail in GCC banks (See Allen and Gale, 2000, 2004; Martinez-Miera and Repullo, 2010; and Allen et al. 2011). This theory argues that an increase in competition erodes the franchise value of banks, and encourage them to take further risks with significant repercussions on financial stability. From the recent evidence, we contradict De Nicoló et al. (2004), Boyd et al. (2006), Schaeck et al. (2009), Schaeck et al. (2009), Liu et al. (2012), and Soedarmono et al. (2013), who reported a negative relationship between market power and financial stability. However, we are consistent with Berger et al. (2009) and Beck et al. (2012), who analyzed the competition-stability nexus in developed economies, where greater bank market power is found to enhance bank stability. We are also in line with the findings of others such as the results of Turk-Ariss (2010a), Jiménez et al. (2010) and Agoraki et al. (2011) on developing countries. All these studies found that more market power is good for the health of banks.

²⁹ We also present this nonlinear effect in Figure 2, Panel B.

As stability is influenced by regulatory factors, we analyze the influence of various regulations on bank stability. Recall also that the nature of the competition stability relationship is influenced by regulations. Thus, to analyze if the effect of market power on bank stability varies with regulations, we incorporate interaction terms that describes bank level market power and regulatory variables.

Regression models 4-6 in Table 6 examine the direct and interactive associations among market power, regulations, and bank financial stability. We find strong effects of regulatory innovation on bank stability. In particular, the capital requirement index was found to have the greatest positive impact on the Z-Score. Thus, banks subject to intense capital requirements regulations are more likely to exercise prudence in their credit and investment decisions and this enhances financial stability (see e.g., Hellmann et al. 2000; and Bolt and Tieman 2004). These findings, on the other hand, contradict Barth et al. (2004), who reported a weak impact of capital regulations on stability. The coefficient of the interaction term of the Lerner index and the capital regulation (column 6) is negative and significant. This indicates that the positive influence of market power on stability could be hampered by weak capital regulations. In the same way, the negative impact of competition on bank charter value and bank stability could be alleviated by strengthening capital requirement regulations. The result is also consistent with the idea that a stringent capital regulation and competition could reduce the amount of credit available for banks to lend and their ability to diversify, thereby leading banks to assume further risk with negative consequences on financial stability. The result here is consistent with the recent empirical studies of Agoraki et al. (2011) and Beck et al. (2012).

The effect of supervisory power regulations on efficiency was also positive and significant. Regulations that strengthen the power of the supervisor may deter managers from taking excessive risks and this improves financial stability. The result here, contradicts Barth et al. (2004), and Agoraki et al. (2011), who found that the supervision regulations were not significant. This difference in our finding may be explained by the weak corporate governance standards and practices that characterize GCC banks, and so a stronger role of the supervisor to monitoring corruption, and bad practices may

compensate for weak corporate governance and may improve financial stability. The parameter associated with interaction term of market power and supervisory power was also negative and significant. Thus we conclude that the bad influence of competition on stability is even worse when supervision regulations are weak.

The impact of the market discipline index is also positive and significant; suggesting that the stronger the disclosure requirements and monitoring of banks, the more discipline banks will exercise, and the higher the financial stability.³⁰ Thus, improving information disclosure requirements, mitigating information asymmetry and reducing transaction costs and allowing private agents to monitor banks will influence positively bank risk-taking behavior and financial stability. The interaction term between market power and market discipline was negative and significant suggesting that the absence of effective market discipline mechanisms the bad influence of competition on stability is more serious.³¹

Finally, the impact of regulations restricting bank activities is insignificant. There appears to be no direct effect of activity restrictions on financial stability. This contradicts Barth et al. (2004), Lepetit et al. (2008a, b) and Agoraki et al. (2011) who show that regulations restricting bank activities reduce bank risk-taking and improve stability. Nevertheless, we obtained negative and statistically significant coefficient for the interaction term between market power and activity restrictions, thus indicating that the benefit of reducing risk by restricting bank activities is greater in competitive markets. The evidence here is consistent with the view that when banks face restrictions on activities, they are more likely to focus more on the loan market to compensate the potential loss of non-interest income. However, due to the increased competition, banks' charter value erodes and their tendency to assume more risks increase; with negative consequences on financial stability (See Agoraki et al. 2011).

³⁰ This finding is consistent with previous literature that provides evidence that supports private monitoring (see Barth et al. 2004).

³¹ Along the same line is the results of Nier and Baumann (2006), who find that in more competitive banking environments market discipline, can play an enhanced role in curbing risk-taking behavior.

The impact on NPLs as a proxy for stability is documented in Table 7. The results are largely in line. The influence of capital requirement and market discipline is negative and significant. Similarly, the interaction between market power and all regulatory factors is positive and significant. However, the only difference is that we obtained insignificant influence for both the supervisory power regulation and the interaction between capital requirement regulations and market power.

INSERT TABLES 6 & 7 ABOUT HERE

The influence of other controls was heterogeneous. For example, bank size is good for bank stability (González, 2005; Jiménez et al., 2010; Houston et al. 2010; and Agoraki et al., 2011). A possible explanation is that large banks are more diversified and more skillfully managed compared to small banks, thereby they are more stable (Lehar, 2005). Furthermore, bank efficiency was insignificant. Similarly were the ownership variables. The influence of ownership on GCC bank stability is inconsistent with Demirgüç-Kunt and Servén (2009), Laeven and Levine (2009), and Agoraki et al. (2011). However, they partially in line with Turk-Ariss (2010a), who found insignificant influence of foreign banks on risk taking in developing countries. Moreover, the diversification variable was positive and significant (e.g., Barth et al. 2004; and Stiroh and Rumble, 2006). Similarly, the impact of equity asset ratio, and hence, the more capitalized banks are the less their tendency to assume risk and the higher the financial stability. The impact of capital on bank GCC stability is consistent with many including Keeley (1990), Boyd and Graham, (1996), Konishi and Yasuda (2004), Lindquist (2004). It is also consistent with Turk-Ariss (2010a), Houston et al. (2010), and Louzis et al. (2012). Not surprisingly, GDP growth was found to be good for promoting bank stability. Finally, the dummy that represents the recent global financial crisis was negative and significant, indicating an increased level of bank instability in the aftermath of the global financial turmoil in 2007-2008.

6. Conclusions

The liberalization of financial services in the GCC aimed to remove entry barriers to allow the establishment of new private banks both domestic and foreign. These measures were expected to

promote competition among banks, with positive repercussions for financial system soundness and stability. Our analysis of market power in GCC banks indicate that competition has increased between 2001 and 2011. However, there exists compelling evidence that competition is bad for financial stability of GCC banks. Our empirical results suggest that the increase in competition erodes banks' charter value and increases their tendency to assume additional risks with associated negative repercussions on financial instability. Similar empirical evidence on the competition-stability relationship was provided by Berger et al. (2009), Turk-Ariss (2010a), Jiménez et al. (2010) and Agoraki et al. (2011) and Beck et al. (2012). On the contrary to our results contradict De Nicoló et al. (2004), Boyd et al. (2006) , Schaeck et al. (2009), Schaeck and Cihak (2011), Liu et al. (2012), and Soedarmono et al. (2013). All these studies reported a positive relationship between competition and financial stability.

Moreover, we find that regulations play a significant role in determining bank stability in the GCC. Our results suggest that capital requirements, official supervisory powers, private monitoring, and restrictions on bank activities are all have a good impact on bank stability. Furthermore, we find that the negative influence of competition on stability is weaker when regulations are tougher. In particular, the bad influence of competition on financial stability can be mitigated by an intense capital requirement, a stronger supervisory regulation, more restrictions on bank activities and enhancement of market discipline through encouraging of disclosure and private monitoring. While the primary focus of the paper is on competition-stability nexus and how it changes given various regulations; we also derive some other interesting results. For instance, we found that larger; more capitalized and more diversified banks are relatively more stable.

The current study has important implications for regulators and supervisors. The evidence of the negative association between bank competition and bank stability indicates that fueling competition may have adverse unintended consequences on bank stability, especially if it was not accompanied by appropriate level of regulations. Thus, to reap the benefits of bank competition, appropriate attention

needs to be paid to banking regulations. Specifically, any attempt to improve the competitive environment should be associated with strengthening regulations and supervision to ensure an eventual correction of the negative consequences of competition on stability.

Finally, we should note that our empirical work did not investigate the difference in competition-stability relationship between Islamic and non-Islamic banks. This might be an interesting topic to handle in future research. Moreover, the financial meltdown in 2007 might have also affected the nature of association, and thus, a comparison between pre-crisis and post-crisis determinants of stability could also be illuminating and we leave this issue to future research.

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Table 1: Banking sector indicators 2010

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
Number of Banks	13	17	17	14	22	28
Bank private credit to GDP (%)	75.2	66.0	37.7	70.4	50.3	92.3
Foreign ownership (%)	56	11	30.0	3.7	13.0	0.2
Islamic banking market share of total assets (%)	29.9	29.0	-	11.5	35.0	13.5
NPLs (%)	7.1	10.4	3.3	3.3	3.0	5.6
ROA	0.87	1.63	1.63	2.41	1.73	1.40
Concentration (%)	55.04	70.21	53.46	70.81	51.63	48.86
Regulatory Capital (%)	20.0	18.0	15.8	16.5	17.0	21.8

Notes: Foreign ownership is the percentage share of foreign ownership in terms of assets; NPLs is the non-performing loans to gross loans concentration is the assets of three largest commercial banks as a share of total commercial banking assets Regulatory Capital is the percentage of bank capital to Risk-Weighted Assets.

Sources: IMF's International Financial Statistics (IFS); World Bank Financial indicators; World Islamic Banking Competitiveness Report 2011-12; and own calculations.

Table 2: Mean and Std. Dev. of variables employed in the Z-Score and market power by country

Variable	Bahrain		Kuwait		Oman		Qatar		Saudi Arabia		UAE		Full sample	
	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.
<i>Panel A: Z-Score variables</i>														
Period-average of return on assets \overline{ROA}_i	0.70	2.19	2.70	2.11	2.33	0.78	3.47	0.84	2.51	0.83	4.21	0.73	2.061	2.064
Equity capital/total assets CAP_i	16.78	10.14	19.91	16.69	16.70	10.84	24.06	26.39	12.01	3.49	21.89	14.36	16.264	16.044
St.Dev. of return on assets σ_{ROA_i}	4.38	5.61	3.28	4.43	1.01	0.76	1.51	0.72	1.12	1.03	2.00	3.27	2.350	2.249
<i>Panel B: Lerner index variables</i>														
<i>Dependent variable</i>														
Total cost C_{it} (in million US \$)	302.33	442.24	348.78	344.07	101.16	99.87	192.09	279.88	685.41	454.75	257.53	360.36	319.35	324.55
<i>Inputs</i>														
Total assets q_{it} (in million US \$)	6956.73	9429.08	9513.32	9226.7	2415.8	2851.2	5555.6	8609.2	20141.	14059.4	6774.2	9807.89	8684.84	8944.03
Personnel expenses/total assets $W_{1,it}$ (%)	1.22	0.92	0.70	0.46	1.26	0.33	0.86	0.50	0.90	0.27	1.08	0.73	0.773	0.728
Other operating expenses/total assets $W_{2,it}$ (%)	5.48	5.71	14.31	48.09	3.18	1.58	3.38	2.65	2.51	1.20	3.74	3.31	8.348	8.151
Interest expenses/ total deposits $W_{3,it}$ (%)	2.48	1.91	1.64	1.08	3.14	1.41	2.03	1.03	2.04	0.65	2.42	1.48	1.803	1.712

Notes: The table reports the descriptive statistics of the variables used in estimating Z-Score and Lerner index. Sources: Fitch-IBCA BankScope and own calculations

Table 3: Description of the variables and sources.

Variable	Description	Source
<i>Financial stability</i>		
Z-Score	Sum of the means of ROA and of equity capital to the standard deviation of ROA	Fitch-IBCA BankScope and authors' calculations
NPLs	Ratio of non- performing loans to total loans	Fitch-IBCA BankScope
<i>Market power</i>		
Lerner Index	A bank-level indicator of bank market power, its measures bank's ability to price above its marginal costs. Higher values indicate less competition and high market power.	Authors' calculations
<i>Regulation</i>		
Capital Requirements	Index that measures the overall capital stringency. The indicator ranges between 0 and 9, with higher values indicating greater stringency.	Barth et al.(2004,2006, 2008)
Supervisory Power	Index reveals the power of the supervisory agencies to take specific actions in relation to their authority against bank management and directors, shareholders, and bank auditors. The indicator ranges between 0 and 14, with higher values denoting greater supervisory power.	Barth et al.(2004,2006, 2008)
Market Discipline	Index that measures the degree to which regulations enable the private sector to monitor banks. The indicator ranges between 0 and 8, with higher values indicating higher degree of disclose accurate information to the public and more incentives to increase private monitoring.	Barth et al.(2004,2006, 2008)
Activity Restrictions	Index aggregates measures that indicate whether bank activities in the securities, insurance and real estate markets, ownership and control of non-financial firms are unrestricted, permitted, restricted, or prohibited. The aggregate indicator ranges between 0 to 16, with higher values indicating greater restrictions.	Barth et al.(2004,2006, 2008)
<i>Bank-level variables</i>		
Bank Size	Logarithm of bank total assets	Fitch-IBCA BankScope
Cost Efficiency	Ratio of total cost to total income	Fitch-IBCA BankScope
Diversification	Ratio of non-interest income to total operating income	Fitch-IBCA BankScope
Capitalization	Book value of equity to total assets	Fitch-IBCA BankScope
<i>Country-level variables</i>		
Public Ownership	Fraction of the banking system's assets in banks that are 50% or more government owned	Barth et al.(2004,2006, 2008)
Foreign Ownership	Fraction of the banking system's assets in banks that are 50% or more foreign owned	Barth et al.(2004,2006, 2008)
GDP Growth	Rate of real GDP growth at constant 2000 prices (annual percentage change)	IMF's International Financial Statistics (IFS)
<i>Global Financial Crisis</i>	Dummy variable takes on values of 1 for crisis years (2007–2008) and 0 otherwise	

Notes: This table details the definitions of variables used to estimate in our regression analysis.

Table 4: Summary statistics of the regression variables

Variable	Bahrain		Kuwait		Oman		Qatar		Saudi Arabia		UAE		Full sample	
	Mean	St.Dev	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.	Mean	St.Dev.
<i>Financial stability</i>														
Z-Score	1.79	1.47	1.64	1.41	1.54	1.23	1.48	1.45	1.53	1.41	1.58	1.28	1.63	1.39
NPLs	6.07	17.32	8.12	13.99	8.95	9.77	6.91	4.50	7.38	7.50	6.94	14.09	7.39	12.91
<i>Market power</i>														
Lerner Index	66.22	102.95	55.43	83.69	34.47	36.90	30.67	64.59	39.43	39.55	37.42	32.00	46.86	62.65
<i>Regulation</i>														
Capital Requirements	3.53	2.17	3.88	2.20	4.03	2.07	4.22	1.92	4.51	1.82	4.29	1.89	4.28	2.04
Supervisory Power	9.00	3.24	9.38	3.35	9.76	3.00	9.71	2.95	10.42	2.57	10.14	2.76	9.72	3.31
Market Discipline	10.03	3.06	10.01	2.77	9.67	2.83	9.35	2.40	8.77	2.28	9.11	2.48	9.56	2.69
Activity Restrictions	8.80	1.83	8.59	1.72	8.48	1.79	8.60	1.79	8.67	2.03	8.80	1.91	8.79	1.88
<i>Bank-level variables</i>														
Bank Size	3.57	0.68	3.60	0.64	3.44	0.59	3.39	0.64	3.56	0.78	3.59	0.73	3.51	0.70
Cost Efficiency	39.01	15.17	40.43	17.16	36.45	12.60	42.21	50.02	49.60	48.95	38.27	41.23	40.88	33.95
Diversification	28.99	18.57	24.04	19.72	23.91	17.06	32.79	32.74	14.68	30.25	24.05	18.21	24.68	33.47
Capitalization	15.35	7.42	17.80	9.12	24.46	32.12	44.46	71.47	34.59	43.65	18.23	16.10	23.59	33.76
<i>Country-level variables</i>														
Public Ownership	60.68	23.44	0.00	0.00	15.33	5.43	7.45	7.45	10.35	10.35	27.00	0.00	20.14	7.70
Foreign Ownership	2.77	3.23	0.00	0.00	0.00	0.00	45.13	1.23	13.73	9.73	35.00	0.00	16.11	2.37
GDP Growth	5.45	4.55	5.90	4.73	5.83	4.98	5.78	4.48	5.79	4.91	5.57	4.73	5.83	4.57

Notes: see Table 3 for detailed definition of each variable. Computed by authors using data from Fitch-IBCA BankScope, Barth et al. (2004, 2006, 2008), IMF's International Financial Statistics (IFS). All variables are expressed in percentage.

Table 5: Correlation matrix of the regression variables.

	Z-Score	NPLs	Lerner Index	Capital Requirements	Supervisory Power	Market Discipline	Activity Restrictions	Bank Size	Cost Efficiency	Diversification	Capitalization	Public Ownership	Foreign Ownership	GDP Growth
Z-Score	1													
NPLs	-0.565*** (0.010)	1												
Lerner Index	0.356*** (0.004)	-0.107** (0.015)	1											
Capital Requirements	0.026 (0.550)	-0.114** (0.019)	-0.137** (0.018)	1										
Supervisory Power	0.144*** (0.001)	-0.055 (0.209)	-0.173** (0.011)	0.398*** (0.000)	1									
Market Discipline	0.139*** (0.001)	-0.105** (0.017)	0.329*** (0.000)	0.390*** (0.000)	0.277*** (0.000)	1								
Activity Restrictions	0.099* (0.024)	-0.022 (0.607)	0.026 (0.546)	0.442* (0.000)	0.078* (0.090)	0.454*** (0.000)	1							
Bank Size	0.075* (0.087)	-0.384** (0.021)	0.345** (0.029)	-0.063 (0.151)	0.013 (0.773)	-0.104** (0.017)	0.208*** (0.000)	1						
Cost Efficiency	0.046 (0.290)	-0.185** (0.020)	0.205*** (0.000)	-0.096** (0.029)	-0.153*** (0.000)	0.195*** (0.000)	-0.035 (0.417)	0.236** (0.040)	1					
Diversification	0.125*** (0.004)	-0.1825* (0.000)	0.398** (0.012)	-0.111** (0.011)	-0.100** (0.022)	0.080* (0.068)	-0.115*** (0.008)	0.206** (0.029)	0.120*** (0.006)	1				
Capitalization	0.194* (0.000)	-0.086** (0.049)	0.327** (0.031)	0.023 (0.598)	0.051 (0.239)	0.027 (0.540)	-0.147* (0.146)	0.469*** (0.000)	0.234*** (0.000)	0.188* (0.000)	1			
Public Ownership	0.179* (0.000)	-0.108** (0.013)	-0.226** (0.017)	-0.316*** (0.000)	0.232*** (0.000)	-0.035 (0.419)	-0.129* (0.100)	-0.012 (0.785)	-0.015 (0.729)	0.068 (0.118)	0.020 (0.641)	1		
Foreign Ownership	-0.043 (0.332)	0.036 (0.408)	0.242** (0.010)	-0.227*** (0.000)	-0.367*** (0.000)	0.477*** (0.000)	0.120*** (0.006)	-0.042 (0.330)	0.237* (0.000)	0.088** (0.043)	0.007 (0.873)	0.089** (0.042)	1	
GDP Growth	0.054** (0.023)	-0.097** (0.027)	-0.066 (0.132)	-0.164*** (0.000)	-0.079* (0.073)	0.072* (0.098)	0.126 (0.236)	0.013 (0.402)	-0.001 (0.972)	0.123*** (0.005)	0.104** (0.018)	-0.010 (0.816)	-0.190* (0.090)	1

Notes: The p-values are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 6: Competition and financial stability (Financial stability variable: Natural logarithm of the Z-Score)

Explanatory variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Dependent variable lagged	0.831*** (0.000)	0.840*** (0.000)	0.891*** (0.000)	0.759*** (0.000)	0.892*** (0.000)	0.888*** (0.000)
Lerner Index	0.593*** (0.006)	0.441 (0.000)	0.464** (0.014)	0.488*** (0.000)	0.471*** (0.009)	0.415*** (0.006)
(Lerner Index) ²		-0.119*** (0.004)		-0.094*** (0.000)		-0.086*** (0.000)
Capital Requirements			0.296*** (0.000)	0.366*** (0.000)	0.273*** (0.000)	0.292*** (0.000)
Supervisory Power			0.319*** (0.000)	0.405 (0.000)	0.408*** (0.000)	0.392*** (0.000)
Market Discipline			0.180*** (0.001)	0.111*** (0.007)	0.062** (0.008)	0.078*** (0.005)
Activity Restrictions			0.021 (0.601)	0.038 (0.638)	0.015 (0.802)	0.015 (0.814)
Lerner index × Capital Requirements					-1.678** (0.013)	-1.655** (0.014)
Lerner index × Supervisory Power					-0.588*** (0.001)	-0.637*** (0.001)
Lerner index × Market Discipline					-0.373** (0.051)	-0.356* (0.068)
Lerner index × Activity Restrictions					-0.837*** (0.003)	-0.837*** (0.003)
Bank Size	3.290*** (0.000)	3.418*** (0.000)	2.362*** (0.000)	2.435*** (0.000)	3.000*** (0.000)	3.029*** (0.000)
Cost Efficiency	0.004 (0.156)	0.003 (0.248)	0.005* (0.076)	0.004** (0.035)	0.005 (0.153)	0.005 (0.133)
Diversification	1.061 (0.128)	1.211 (0.188)	1.279* (0.071)	1.345* (0.063)	1.927** (0.039)	1.840** (0.037)
Capitalization	0.028*** (0.000)	0.026*** (0.001)	0.031*** (0.000)	0.018*** (0.000)	0.026*** (0.000)	0.027*** (0.000)
Public Ownership	-3.471* (0.077)	-3.141 (0.233)	-3.490 (0.110)	-3.484 (0.120)	-1.969 (0.267)	-1.987 (0.257)
Foreign Ownership	2.401 (0.638)	2.119 (0.905)	2.608 (0.502)	1.853 (0.823)	1.204 (0.926)	1.288 (0.895)
GDP Growth	0.135*** (0.000)	0.138*** (0.000)	0.122*** (0.000)	0.169*** (0.000)	0.126*** (0.000)	0.127*** (0.000)
Global Financial Crisis	-6.371*** (0.000)	-6.378*** (0.000)	-6.423*** (0.000)	-5.684*** (0.000)	-6.069*** (0.000)	-6.093 (0.000)
Constant	15.273*** (0.000)	15.901*** (0.000)	10.965*** (0.000)	13.623*** (0.000)	14.547** (0.040)	14.572** (0.042)
Wald test	13384.22*** (0.000)	11488.65*** (0.000)	28606.39*** (0.000)	224242.92*** (0.000)	7165.94*** (0.000)	7165.94*** (0.000)
AR(1)	-1.963* (0.072)	-1.991* (0.069)	-1.461* (0.096)	-1.099 (0.121)	-1.055 (0.128)	-1.034 (0.111)
AR(2)	-0.745 (0.381)	-0.668 (0.492)	-0.685 (0.416)	-0.183 (0.769)	-0.270 (0.723)	-0.289 (0.722)
Sargan test	13.211 (0.137)	12.490 (0.153)	12.861 (0.166)	12.885 (0.169)	11.383 (0.194)	11.558 (0.187)

Note: Wald is a test statistics indicating goodness of fit of the regression, Sargan is a test statistics for overidentifying restrictions, AR(1) and AR(2) are tests statistics for first and second order autocorrelations, respectively. *P*-values are in parentheses. The *, **, and *** denote statistical significance at the 10, 5, and 1% level, respectively.

Table 7: Competition and financial stability (Financial stability variable: NPLs)

Explanatory variables	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Dependent variable lagged	0.281*** (0.000)	0.325*** (0.000)	0.214*** (0.000)	0.256*** (0.000)	0.160*** (0.000)	0.232*** (0.000)
Lerner Index	-6.816*** (0.000)	-6.967 (0.005)	-6.600*** (0.000)	-5.359*** (0.001)	-5.491*** (0.000)	-6.736*** (0.001)
(Lerner Index) ²		0.676*** (0.000)		0.695 (0.000)		0.873*** (0.000)
Capital Requirements			-3.742*** (0.000)	-3.598*** (0.000)	-3.410*** (0.000)	-5.891*** (0.000)
Supervisory Power			0.045 (0.865)	0.019 (0.935)	0.013 (0.875)	0.031 (0.818)
Market Discipline			-2.636*** (0.000)	-2.697*** (0.000)	-2.900*** (0.000)	-2.367*** (0.000)
Activity Restrictions			-0.501* (0.075)	-0.536* (0.069)	-0.451 (0.178)	-0.508 (0.106)
Lerner index × Capital Requirements					8.228*** (0.000)	7.744*** (0.000)
Lerner index × Supervisory Power					1.517*** (0.000)	1.124*** (0.000)
Lerner index × Market Discipline					0.955*** (0.004)	1.321*** (0.000)
Lerner index × Activity Restrictions					0.480** (0.020)	0.310** (0.042)
Bank Size	-9.181 (0.000)	-7.827*** (0.000)	-6.670*** (0.000)	-5.955*** (0.000)	-6.508*** (0.000)	-6.314*** (0.000)
Cost Efficiency	0.005 (0.384)	0.001 (0.446)	0.002 (0.639)	0.002 (0.748)	0.008 (0.400)	0.007 (0.464)
Diversification	-18.731*** (0.000)	-15.626*** (0.000)	-17.112*** (0.000)	-16.260*** (0.000)	-16.193*** (0.000)	-16.742*** (0.000)
Capitalization	-0.411*** (0.000)	-0.392*** (0.000)	-0.349*** (0.000)	-0.282*** (0.000)	-0.196** (0.029)	-0.149** (0.044)
Public Ownership	5.666* (0.090)	3.638 (0.330)	3.314 (0.488)	2.368 (0.546)	2.325 (0.560)	1.757 (0.765)
Foreign Ownership	-4.120 (0.218)	-4.054 (0.337)	-3.350 (0.981)	-3.422 (0.925)	-2.000 (0.791)	-2.649 (0.924)
GDP Growth	-0.168*** (0.000)	-0.158*** (0.000)	-0.168*** (0.000)	-0.149*** (0.000)	-0.185 (0.000)	-0.178*** (0.000)
Global Financial Crisis	0.618** (0.048)	0.564** (0.047)	0.460** (0.026)	0.441** (0.029)	0.552** (0.023)	0.540** (0.026)
Constant	41.559*** (0.000)	40.430*** (0.000)	32.645*** (0.000)	35.242*** (0.000)	31.696*** (0.000)	31.686*** (0.000)
Wald test	1998.52*** (0.000)	3694.43*** (0.000)	2889.18*** (0.000)	3184.49*** (0.000)	4830.14*** (0.000)	4912.47*** (0.000)
AR(1)	-1.582 (0.113)	-1.669* (0.095)	-1.681* (0.092)	-1.719* (0.085)	-1.578 (0.114)	-1.562 (0.118)
AR(2)	-0.374 (0.707)	-0.372 (0.709)	-0.465 (0.641)	-0.416 (0.677)	-0.557 (0.577)	-0.517 (0.604)
Sargan test	22.408* (0.070)	22.782 (0.068)	22.654* (0.086)	20.682 (0.110)	21.475* (0.090)	18.647 (0.178)

Note: Wald is a test statistics indicating goodness of fit of the regression, Sargan is a test statistics for overidentifying restrictions, AR(1) and AR(2) are tests statistics for first and second order autocorrelations, respectively. *P*-values are in parentheses. The *, **, and *** denote statistical significance at the 10, 5, and 1% level, respectively.

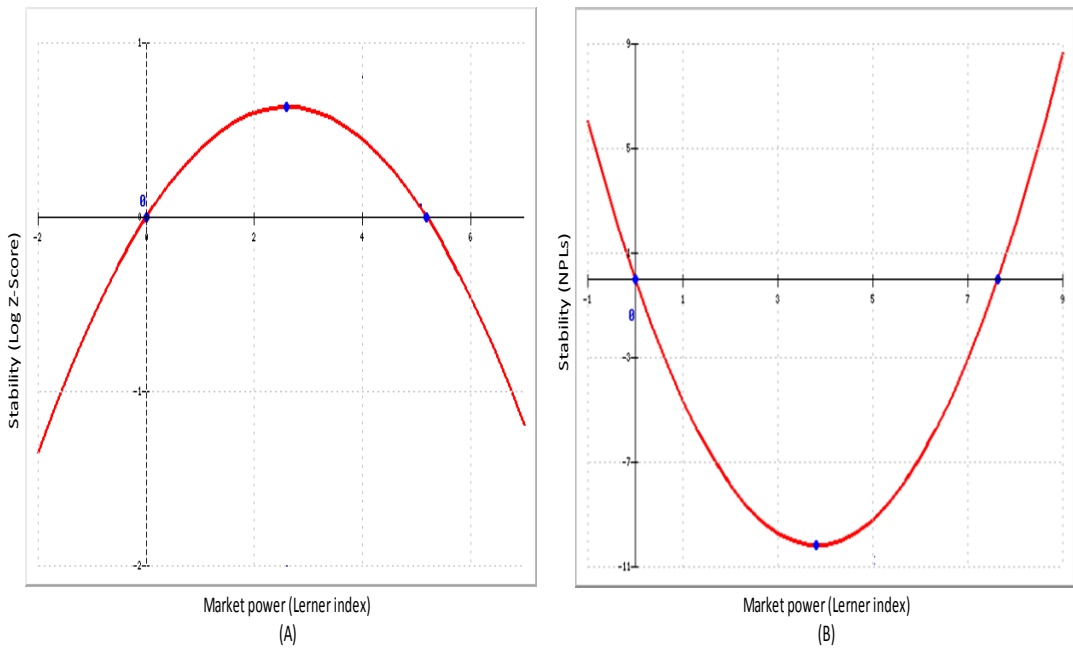
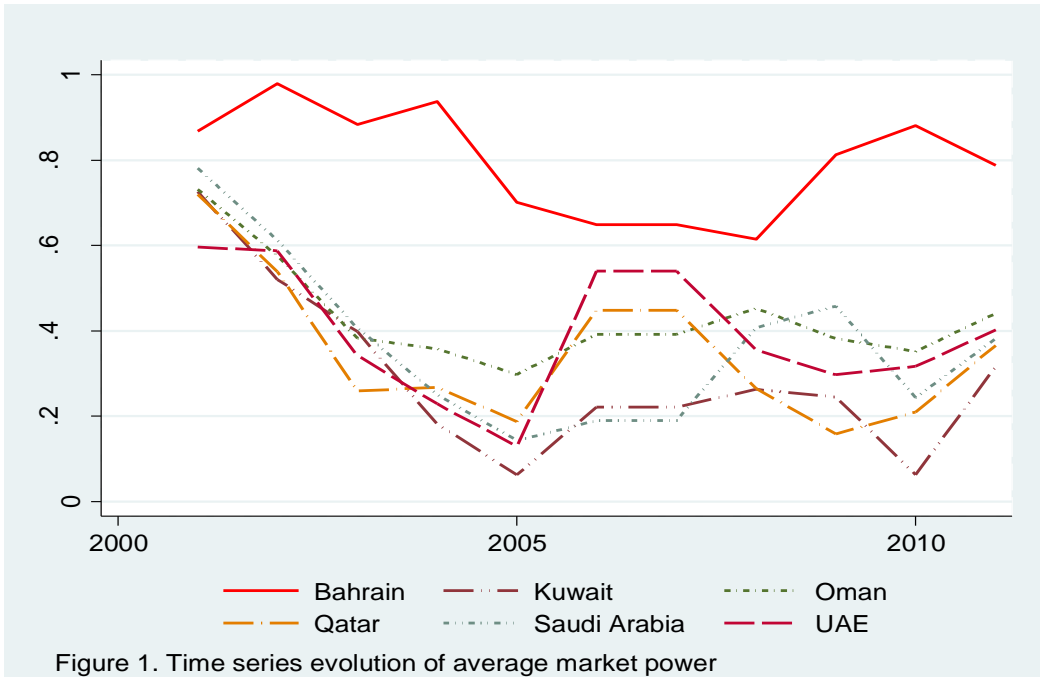


Figure 2. Marginal effect of market power on the stability- Model (4) of Tables 6&7.