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Competition and Market Structure of Banking Sector: A Panel Study of Jordan and GCC Countries

(Persaingan dan Struktur Pasaran dalam Sektor Perbankan: Satu Kajian Panel dari Jordan dan Negara GCC)

Anwar Salameh Gasaymeh
Zulkefly Abdul Karim
Mariani Abdul Majid
Mansor Jusoh
Fakulti Ekonomi dan Pengurusan
Universiti Kebangsaan Malaysia

ABSTRACT

This paper examines the market structure and competitiveness of the banking industry in Jordan and the GCC countries during the period 2003-2010, using a method proposed by Panzar and Rosse (1987). Using a static and dynamic panel data framework for a sample of 90 commercial banks, the empirical results revealed that banks in Jordan and the GCC countries have generated their revenue under monopolistic competition. This finding indicates that banks in Jordan are able to compete with the banking sector in the GCC countries. Therefore, the Jordanian government should seriously consider joining the GCC group of countries in the future.

Keywords: Competitive conditions; Panzar and Rosse model; Dynamic GMM; Banking sector of Jordan and GCC

ABSTRAK

Kertas ini memeriksa struktur pasaran dan persaingan dalam industri perbankan di negara Jordan dan negara GCC dalam tempoh 2003-2010 dengan menggunakan kaedah yang dicadangkan oleh Panzar dan Rosse (1987). Rangka kerja data panel statik dan dinamik telah digunakan untuk sampel 90 buah bank perdagangan, dan keputusan empirikal menunjukkan bank di Jordan dan negara GCC menjana pendapatan mereka di bawah syarat persaingan bermonopoli. Keputusan kajian ini juga menjelaskan bank di Jordan mempunyai kemampuan untuk bersaing dengan bank-bank di rantau GCC . Maka, kerajaan Jordan seharusnya membuat pertimbangan yang serius untuk menyertai kumpulan GCC tersebut pada masa hadapan.

Kata kunci: Syarat persaingan; model Panzar dan Rosse; Dinamik GMM; Sektor perbankan di Jordan dan GCC

INTRODUCTION

Revolutionary changes in the financial sector in the Middle Eastern countries, particularly in Jordan and the Gulf Cooperation Council (GCC), is reflected in the rapid financial deregulation, technological advances and financial innovation. These changes also have an impact on the role of banks and intermediaries with respect to pooling of financial resources; i.e. from surplus units and channeling the funds to deficit units for investment purposes, which would promote greater economic growth. The financial deregulation and rapid advancement in information and telecommunication technology increased the competition among banks, leading to financial innovation in the financial intermediaries, including banks. This financial development has provided new investment opportunities to households and firms in generating a higher revenue and better risk management. Therefore, financial products took the place of financial intermediaries in the systematic approach towards seeking the best financial solutions to specific problems of their clients, taking into account the current state of technology, finance and organizational theory (Merton and Bodie 1995).

In this dynamic new banking environment, the level of competition in the banking sector of Jordan and the GCC depend on the overall operational efficiency of the banks, as well as the ability to conduct financial innovation as they respond to new technological changes. Hence, banks' competition measures are good indicators to gauge on how these competitive banks have become as the industry continues to develop. Banks that are relatively non-productive would be less efficient and therefore would lose market share and be replaced by the more productive ones. This is consistent with the functional financial intermediation view that

institutional structures are always changing towards those that are more efficient in performing the financial intermediation roles (Batchelor 2005).

Hart (1983) stated that the pressure of competition is usually the most effective instrument in promoting productive efficiency and encouraging management to operate close to their production frontier. Hauner and Peiris (2005) argued that the higher degree of competition within the banking system leads to higher efficiency; where this contributes to greater financial stability, product improvement, and better access by households and corporations to financial services. This could improve the economic growth prospects of a country. In this regard, there is concern that countries which are monopolistic are inefficient, and the fragile banking systems in several low-income countries could become a major hindrance to economic development. Therefore, it is essential to embrace the changes and environment that encourage competition and efficiency within the banking systems.

The revolutionary changes in the financial industry, particularly in the development of internet banking has definitely changed the nature of market structure and the extent of competition level among banks [see for example, Yildirim and Philippatos (2007), Claessens et al. (2001), Bikker et al. (2009), Dietsch and Lozano-Vivas (2000) and Berger et al. (1999)]. There are two reasons why the study of banking competition is interesting in the case of Jordan and the GCC countries. First, the banking system in Jordan had experienced an extensive evolution in its market structure and the regulatory environment since the late 1990s.[1] Second, Jordan is in the process of becoming a member of the GCC, which of a co-operation status, comprising six countries namely; Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE. In fact, the GCC intends to form a union in the near future. One of the criteria of forming a union is that member countries ought to have similar level of competition, particularly, in the banking sector. Therefore, it is important to investigate the level of competition and market structure of the banks in Jordan in evaluating their ability to compete and survive in the GCC union. This study focuses on the sample period after the structural changes and the adoption of latest technology in the late 1990s in the banking sector in Jordan and the GCC countries.

The focal point of this paper is to examine the level of competition in the Jordanian banking sector relative to the GCC, by adopting the Panzar and Rosse (1987) methodology. The paper contributes to the existing literature by improving and extending the earlier studies in three dimensions. First, this study revisits the level of banking competition and market structure in Jordan relative to the GCC banking sector during the era of internet banking. For this purpose, the Panzar and Rosse model is used, in which enables the calculation of a measure of market structure. Second, this study uses a larger sample of banks in the current period, as it is the first study to compare banks operating in Jordan relative to those in the GCC. Third, this study uses both the panel data techniques, namely static panel and dynamic panel.

The results of this study revealed that the estimated *H* statistics for the sample period are positive and the Wald test for either monopoly or perfect competition market structure is rejected. Thus, the finding indicates that the banks in Jordan and GCC countries generated their revenue under monopolistic competition. Therefore, the banking sectors in Jordan have the ability to compete with banks in the GCC countries.

The rest of this paper is organized as follows. The subsequent section discusses earlier studies relating to measuring the competition levels in various countries. The third section deals with the theoretical aspect of bank-competition. The fourth section explains the estimation procedures by using the dynamic panel data in GMM framework. The fifth section reports the empirical findings followed by summary and conclusion in the last section.

LITERATURE REVIEW

This section reviews the most relevant studies on banking competition using Panzar and Rosse (1987) model, based on cross country, and individual economies of developed and developing countries.

The theoretical concept of contestable market developed by Baumol (1982) shows that oligopolies and monopolies do sometimes behave like perfectly competitive firms. The theory of contestable markets for the banking industry has attracted many researchers in examining the degree of market structure of the banking industry. For example, the most notable studies among many others, are by Shaffer (1982, 1985, 1993), Nathan and Neave (1989), Molyneux and Forbes (1995) and Molyneux et al. (1996). These previous studies employed the Rosse and Panzar (1977) model in examining the competitive conditions of the banking sector in the U.S, Canada, Japan and Europe. Nathan and Neave (1989) found some evidence that the U.S and Canadian banking markets are operating under monopolistic competition.

The first application of the Panzar and Rosse test on banking data was by Shaffer (1982), where his results revealed monopolistic competition for a sample of banks operating in New York. Similar results were shown by Molyneux and Forbes (1995) for European banks in France, Germany, Spain and the UK for the period 1986-1989, while the Italian banking sector indicated a monopoly market. De Bandt and Davis (2000) found monopolistic competition markets for France, Germany, Italy and the US during the period 1992-1996. The study by Nathan and Neave (1989) for Canada, Molyneux et al. (1996) for Japan, Staikouras and Koutsomanoli-Fillipaki (2006) for a large number of European Union members reported similar results, that is the banks are operating

under monopolistic competition. On the other hand, Bikker and Haaf (2002) have examined the competitive conditions for banks in 23 industrial countries using the Panzar and Rosse model; and they concluded that the banking sectors under study were characterized by monopolistic competition.

Many studies used the popular model of Panzar and Rosse, with adaptations recommended by Bikker et al. (2006) and Goddard and Wilson (2009). Panzar and Rosse (1987; 1982) and Nathan and Neave (1989) and Perrakis (1991). Their studies assumed that firms enter or leave the market quickly, without losing their capital, and that their possible competitors operate on the same cost functions as established firms. One of the restrictions of the Panzar and Rosse tests is that it gives ambiguous results when the banks in question are not completely adjusted to the market conditions. However, the test usually shows that the market is competitive and that the monopoly power has not been exercised. Secondly, it cannot differentiate between competitive pricing and simple costing plus pricing.

Few studies that examined the competition level for the banking sector in developing countries had used the Panzar and Rosse model, for example Al-Muharrami et al. (2006) and Turk Ariss (2010). The only study on GCC countries is by Al-Muharrami et al. (2006). This study investigated the market structure of the GCC banking sector for the period 1993-2002 and evaluated the monopoly power of banks. Their investigation suggested that there are advantages in examining the banks of the GCC countries as an aggregate. Overall the GCC banking system could be viewed as operating under the condition of monopolistic competition. The results showed that all countries are in equilibrium and that Kuwait, Saudi Arabia and UAE have un-concentrated markets and are moving towards less concentrated positions. Additionally, the Panzar and Rosse results suggested a mixed bag of competitive, monopolistic competition and monopoly within the GCC economies. The study of Turk Ariss (2010) for the Middle Eastern countries showed that, except for countries in North Africa where monopolistic conditions are found, the prevailing market structure in Middle East and North African (MENA) banking sector is mostly monopolistic competition. The results indicate that Islamic banking is less competitive compared to conventional banking.

Several studies analyzed competition in banking sector over time using Panzar and Rosse (1987) model, assuming that competition gradually changes over time or by providing yearly estimates of competition. Some of these studies focused on cross country comparison in developed countries. Cross country studies were carried out by Goddard and Wilson (2009) for G7 countries, and Berger et al. (2009) for 8,235 banks in 23 developed countries, De Bandt and Davis (2000) for France, Germany, Italy and Yildirim and Philippatos (2007) for 11 Latin American countries. The results of Goddard and Wilson (2009) indicated that banks in these countries are operating under monopolistic competition, while Berger et al. (2009) suggested that consistent with the traditional "competition-fragility" view, banks with a higher degree of market power also have less overall risk exposure. The result also provided some support for one element of the "competition-stability" view, whereby market power increases loan portfolio risk. They showed that this risk could be offset in part by higher equity capital ratios. The study by De Bandt and Davis (2000) for France, Germany, Italy and the US for the period 1992-1996 showed that within the European Union, Germany and France monopolistic competition describes the large banks, while monopoly for the small ones. Meanwhile, in Italy there is evidence of monopolistic competition for small and large banks. Yildirim and Philippatos (2007) examined the competitive conditions of the banking industries in eleven Latin American countries for the period 1993–2000. They concluded that banks in these countries appeared to generate revenues and operate under monopolistic competition.

Other researchers focused on individual countries in the developed and less-developed economies. For example, Daley and Matthews (2012) studied the Jamaican banking market for the period 1998 to 2009 and Mkrtchyan (2005) used the sample of American banks. They found monopolistic competition in the market as a whole. Matthews et al. (2007) examined the major British banks, during the period of major structural change. Rosse and Panzar estimated the *H*-statistic for a panel of 12 banks for the period 1980-2004. The results confirmed the consensus finding that competition in British banking is most accurately characterized by the theoretical model of monopolistic competition.

Given the above discussion, this study would contribute towards filling the gap by providing new empirical evidence for the market structure and competition level in Jordan and in the GCC countries. This is because there is no earlier study on banking competition and market structure of the Jordanian banking sector relative to the GCC countries. This paper could be construed as the first of such study. Therefore, the focal point of this study is to comprehensively investigate the degree of market structure and competition condition of the banking industry in Jordan relative to the entire six GCC countries, based on the large number of conventional and Islamic banks.

THEORETICAL MODEL

Rosse and Panzar (1982, 1987, 1977) developed a simple model of market competition in examining the market structure. There are two assumptions of the model. First, firms enter or leave rapidly, without losing the potential competitors or lose of their capital. Second, the cost functions are identical for potential competitor and incumbent companies on the market. The central argument is that, although the market is

contestable, the threat of market entry with price-cutting by potential competitors enforces marginal cost pricing by incumbents, so that in equilibrium they would not earn excess profits and no entry is observed to occur.

However, Shaffer (2004) noted that the Panzar and Rosse model is preferred as it is robust even in small empirical samples and works well with firm-specific data on revenues and factor prices without requiring information on equilibrium output prices and quantities for the sector . Therefore, this study employs the "Non-Structural Model" approach suggested by Rosse and Panzar (1977) and Panzar and Rosse (1982, 1987), the so called *H*-statistic to study the market structure of Jordan relative to the GCC banking sector. This method has been widely used in the examination of competitive structure of banking industry in various countries.

The test is derived from a general banking market model, which determines equilibrium output and the equilibrium number of banks, by maximizing profits at both the banking level and the sector level. This implies firstly, that bank maximizes its profits, where marginal revenue equals marginal cost:

$$R'_{it}(y_{it}, n_t, k_{it}) - C'_{it}(y_{it}, p_{it}, q_{it}) = 0 \qquad (1)$$

R_{it} indicates revenues and C_{it} to costs of bank i (the prime denoting *marginal*), y_{it} is the output of bank i , n is the number of banks, p_{it} is a vector of m factor input prices of bank i, k_{it} is a vector of exogenous variables that shift the bank's revenue function, q_i is a vector of exogenous variables that shift the bank's cost function. Secondly, at the market level, it means that, in equilibrium, the zero profit restriction holds:

$$R^*_i(y^*, n^*, k^*) - C^*_{it}(y^*, p, q) = 0 \qquad (2)$$

Variables marked with an asterisk (*) refer to equilibrium values. Market power is considered by the extent to which a change in factor input prices (dp_{mi}) is reflected in the equilibrium revenues (dR^*_i) earned by bank i. Panzar and Rosse define a measure of competition H as the sum of the elasticities of the reduced-form revenues with respect to factor prices:

$$H = \sum_{k=1}^{m} \frac{\partial R^*_i}{\partial w_{ki}} \frac{w_{ki}}{R^*_i} \qquad (3)$$

Where R_i indicates revenues of bank i (* refers to equilibrium values) and w_t is a vector of m factor input prices of bank i. Market power is considered by the extent to which a change in factor input prices ∂w_{ki} reflects the equilibrium revenues ∂R^*_I earned by bank i.

The *H*-statistic measures the sum of the elasticities of banks' total revenue with respect to input prices. Hence, it is calculated as the sum of the input prices coefficients β_1, β_2 and β_3 as shown in equation (4):

$$H = \sum_{j=1}^{J} \beta_j \qquad (4)$$

Where j=1, ...J, and J is the number of inputs included in the calculations. The Panzar-Rosse's H statistic is interpreted as follows: H is equal to zero or negative when the competitive structure is monopoly or perfectly colluding oligopoly. When H equals 1, it refers to perfect competition and 0<H<1 refers to monopolistic competition. H could be interpreted as a continuous measure of the level of competition, in particular between 0 and 1, in the sense that higher values of H indicate stronger competition than lower values [Bikker and Haaf (2002); Goddard et al. (2001) and Casu and Girardone (2006)].

The empirical application of the Panzar and Rosse approach assumes a log-linear marginal cost function (dropping subscripts referring to bank i).

$$\ln Mc = \beta_0 + \beta_1 \ln y + \sum_{i=1}^{m} \delta_i p_i + \sum_{j=1}^{g} \gamma_j \ln q_j \qquad (5)$$

Where y is output of the bank, p_i is the factor input price and q is other variable, exogenous to the cost function as in equation (4). Equally, the underlying marginal revenue function has been assumed to be log-linear of the form.

$$\ln MR = \alpha_0 + \alpha_1 \ln y + \sum_{i=1}^{h} \varphi_i \ln k_i \qquad (6)$$

Where k_i is variable associated to the bank-specific demand function. For a profit-maximizing bank, marginal costs equal marginal revenues in equilibrium, yielding the equilibrium value for output (denoted by an asterisk):

$$\ln y^* = \left[(\beta_0 + \alpha_0 + \sum_{i=1}^{m} \delta_i \ln p_i + \sum_{j=1}^{g} \gamma_j \ln q_j - \sum_{i=1}^{h} \varphi_i \ln k_i)/ (\alpha_1 + \beta_1) \right] \qquad (7)$$

The reduced-form equation for revenues of bank i is the product of the equilibrium values of output of bank i and the common price level, determined by the inverse-demand equation, in logarithms, of the form $\ln P = \omega + \eta \ln \sum_i y^*_i$.

RESEARCH METHOD

DATA

The data set was obtained from the Bankscope database of Bureau van Dijk's company which employs an unbalanced annual bank level data of the banks operating in Jordan and in the GCC countries (namely, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE). It was drawn from 15 major banks of Jordan's banking sector and 75 major banks of the GCC countries, including conventional and Islamic banks, encompassing a time span from 2003-2010. Three input factors, namely deposits, labor, and physical capital are considered in estimating the baseline model in equation (7). This study also included some of bank-specific factors to account for size, risk, and capacity differences. The factors are total assets to account for possible scale economies,

equity which is the ratio of total equity to total assets, net loans, and capacity indicator such as total fixed assets.

ESTIMATION PROCEDURE

This study employed two types of panel data techniques, namely static and dynamic model. For the static panel model, this study used the fixed effects model. Fixed effect is controlling for unobserved heterogeneity when heterogeneity is constant over time and correlated with independent variables. On the other hand, for the dynamic panel, this study applied the generalized method of moments (GMM) as proposed by the Arellano and Bond (1991); Arellano and Bover (1995) and Blundell and Bond (1998). This technique has an advantage in addressing the Nickell (1981) bias associated with the fixed effects in short panel, bias due to the presence of the lagged dependent variable and bias due to the endogeneity of other explanatory variables.

The Panzar and Rosse's *H* statistic is equal to the sum of the related elasticities: $H = PF + PL + PK$. Panzar and Rosse showed that the *H*-statistic is calculated from the reduced form revenue equation and measures the sum of elasticities of total revenue of the banks with respect to the banks' input prices, which could be used to recognize the structure of the market in which the firm operates. The value of $H = 1$ indicates perfect competition, in which an increase in cost causes some firms to exit, price to increase, and the revenue of survivors to increase where at the same time cost will increase (Goddard et al., 2001). *H* value will be negative for collusive oligopoly or monopoly in which an increase in costs causes output to fall and price to increase. An upward shift in the marginal cost curve is associated with a reduction of revenue as a result of the optimality condition for the monopolist. $0 < H < 1$ indicates monopolistic competition, in which an increase in costs causes revenues to increase at a lower rate than that of costs.

The point of challenge is that Panzar and Rosse model is static and presumes market equilibrium or instantaneous adjustment to equilibrium at each time point when the data are observed. Goddard and Wilson (2009) noted that the presumption is not in line with reality as adjustment towards equilibrium is often not instantaneous and markets are therefore not necessarily in equilibrium; and therefore they recommend dynamic estimation model. Moreover, equilibrium within the banking sector does not mean that competitive condition is not allowed to change during the sample period, it only implies that changes in banking are gradual [Al-Muharrami et al. (2006)].

The test for long-run equilibrium is performed with the following equation:

$$\begin{aligned}\ln(1 + ROA_{it}) = {} & h1 \ln(PF_{it}) + h2 \ln(PL_{it}) \\ & + h3 \ln(PK_{it}) + \ln(ASSETS_{it}) \\ & + \ln(EQUITY_{it}) + \ln(LOAN_{it}) \\ & + \ln(FIXED_{it}) + u_i + \lambda_t + \varepsilon_{i,t} \qquad (8)\end{aligned}$$

Following to Claessans and Laeven (2004) and Casu and Giradone (2006), the measure of ROA is actually calculated as ln(1+ROA) to adjust for (small) or negative values of ROA; where ROA is the pre-tax return on assets (pre-tax profits to total assets), because return on assets could take on (small) negative values. This could define the equilibrium *E*-statistic as $h_1 + h_2 + h_3$ in testing whether $E = 0$, by using the *F*-test. If rejected, the market is assumed not to be in equilibrium. The scheme behind this test is that, in equilibrium, returns on bank assets should not be linked to input prices. This approach of testing on whether the observations are in long-run equilibrium has previously been used in the literature by Shaffer (1982) and Molyneux et al. (1996).

Based on earlier studies by Shaffer (1982, 1985), Molyneux et al. (1994), Nathan and Neave (1989) and Hondroyiannis et al. (1999), this study estimated the bank revenue function in static model in equation (9) in which revenue is explained by factor prices and other bank-specific variables. A fixed effects panel data model is used to estimate reduced form revenue equation. In order to derive the Panzar and Rosse's *H*-statistic method, the following baseline model has been estimated:

$$\begin{aligned}\ln(REV_{it}) = {} & h1 \ln(PF_{it}) + h2 \ln(PL_{it}) \\ & + h3 \ln(PK_{it}) + \ln(ASSETS_{it}) \\ & + \ln(EQUITY_{it}) + \ln(LOAN_{it}) \\ & + \ln(FIXED_{it}) + u_i + \lambda_t + \varepsilon_{i,t} \qquad (9)\end{aligned}$$

For $t = 1 \ldots T$, where *T* is the number of periods observed, and $i = 1 \ldots n$, where *n* is the total number of banks and *ln* is the natural logarithm. The dependent variable (REV) is the ratio of total revenue to total assets and thus accounts for both the banks interest and non-interest income. The variable is divided by total assets in order to account for size differences. Usually with intermediation approach, it is assumed that banks use three inputs factors, namely, deposits, labor, and physical capital. Variables PF, PL and PK are the unit prices of these three inputs or reasonable proxies. Specifically, PF is the ratio of interest expenses to deposits and other liabilities, PL is the ratio of personnel expenses to total assets, and PK is the ratio of other non-interest expenses to fixed assets. To control for the yearly macro effects, under the PR framework, the *H*-statistic is equal to the sum of the elasticities of the revenue with respect to the three input prices: $H = h_1 + h_2 + h_3$. The testable hypothesis for monopolistic competition is $0 < H < 1$, while $H \leq 0$ is monopoly. All variables are in logarithmic form.

Finally ε_{it} is a two-component error term for the *i*-th firm that could be written as follows: $\varepsilon_{i,t} = \mu_{it} + \nu_{it}$, where ν_{it} is a two-sided error term capturing the effects of statistical noise, assumed to be independent, identical and normally distributed with zero mean and variance σ^2_{ν}. ε_{it} is also assumed to be independent with $\mu_{it} = \{\mu_i \exp[-n(t - T)]\}$, where μ_i is a one-sided error term to capture the effects of inefficiency and could be assumed half normally distributed with mean zero and variance σ^2_u;

and n is an unknown parameter to be estimated capturing the effect of inefficiency change over time.

DYNAMIC PANEL GMM

The employment of static estimator, such as fixed effect or random effect, might lead to bias in the estimates [Goddard and Wilson, (2009)]. These studies further used the Generalized Method of Moments (GMM) to complete the following equation:

$$\begin{aligned}\ln(REV_{it}) = {} & \alpha_0 + \alpha_1 ln(REV_{it-1}) + h1 \ln(PF_{it}) \\ & + h2 \ln(PL_{it}) + h3 \ln(PK_{it}) \\ & + \alpha_2 \ln(ASSETS_{it}) + \alpha_3 \ln(EQUITY_{it}) \\ & + \alpha_4 \ln(LOAN_{it}) + \alpha_5 \ln(FIXED_{it}) \\ & + \eta_i + \lambda_t + \varepsilon_{i,t} \qquad (10)\end{aligned}$$

To remove the firm specific effect (η_i) in Equation (10), Arellano and Bover (1995) proposed a forward orthogonal deviation transformation or forward Helmert's system. This transformation fundamentally subtracts the mean of future observations available in the sample from the first T–1 observation. The advantage is to maintain sample size in panels with gaps. On the other hand, a first-difference transformation has some weaknesses, in which, if some explanatory variables (REV_{it}) are missing, then REV_{it} and REV_{it} + 1 are also missing in the transformed data [Roodman (2009)]. However, under orthogonal deviations, the transformed REV_{it} + 1 need not go missing.

The form of a linear dynamic panel regression in equation (10), where one or more lags of the dependant variables are included as covariant and unobserved individual, contains fixed or random effect. By assembly, the individual effects are correlated with the lagged dependent variable. Interpretation of the standard fixed or random effects estimators are inconsistent. Arellano and Bond (1991) adopted a Generalized Method of Moments (GMM) estimator for such model, where this model is known as the difference GMM. The lagged exogenous variables values constitute genuine instruments for the first-differenced, lagged dependent variable. However these lagged variables might provide little information about the first differences [Arellano and Bond (1991) and Blundell and Bond (1998)].

The consistency of the system GMM estimator depends on both the assumptions that the error term is not auto-correlated and also on the strength of the instruments used. The two specification tests are explained as follows. The first examines the validity of the instruments by analyzing the sample analogue of the moment conditions used in the estimation procedure based on Hansen test of over-identifying restrictions. The second test examines the hypothesis of no autocorrelation in the error term. The occurrence of first-order autocorrelation in the differenced residuals does not mean that the estimates are not consistent. However, the occurrence of second-order autocorrelation implies that the estimates are not consistent. The addition of the lagged dependent variables in the baseline banks' revenue function in equation (10) implies that there is correlation between the regressors and the error term, $\ln(REV_{it}) - (REV_{it-1})$ depends on $\varepsilon_{i,t-1}$, which is a function of the bank-specific effect (η_i).

Given the correlation, the dynamic panel data estimation in equation (10) suffers from Nickell (1981) bias, which disappears only if T is large or approaches infinity. Thus, Arellano and Bond (1991) Arellano and Bover (1995) and Blundell and Bond (1998) proposed GMM estimators to deal with the endogeneity problem (the correlation between the lagged dependent variable and the error term).

Arellano and Bond (1991) and Arellano and Bover (1995) recommended that the lagged levels or untransformed regressors be used as an instrument for the transformed variable. This relates to the difference GMM. However, Alonso-Borrego and Arellano (1999) and Blundell and Bond (1998) proved that if the lagged dependent and the explanatory variables are determined over time or nearly a random walk, then lagged levels of these variables are weak instruments for the regression equation in differences. This takes place either as the autoregressive parameter (α) approaches unity, or as the variance of the individual effects (η_i) increases relative to the variance of the transient shocks (ε_{it}). Hence, to decrease the prospective bias and imprecision related to the difference estimator, Blundell and Bond (1998) proposed system GMM approach by combining regression in differences and regression in levels. In addition to the regression in differences, the instruments for the regression in levels are the lagged differences of the corresponding instruments.

However, system GMM could generate moment conditions prolifically as noted by Roodman (2009). Adding too many instruments in the system GMM will overfit the endogenous variable. This could weaken the Hansen test of the instruments' joint validity. Thus, this study used two main techniques to avoid instruments proliferation and limit the number of instruments, such as by using only certain lags instead of all available lags for instruments and combining instruments through addition into smaller sets by collapsing the block of the instrument matrix. This technique was used by earlier researchers, including Calderon et al. (2002), Beck and Levine (2004), Cardovic and Levine (2005), Roodman (2009), Azman-Saini et al. (2010), Karim et al. (2011), Karim (2012) and Karim and Azman-Saini (2013).

This study used difference GMM estimation (one step and two-step). For robustness checking, the estimated system GMM (one step and two-step) is used. The benefit of using GMM estimator in producing unbiased, consistent, and efficient results is highly dependent on the adoption of the suitable instruments. There are three specification tests as suggested by Arellano and Bond (1991); Arellano and Bover (1995) and Blundell and Bond (1998). First, the Hansen test of over identifying restrictions, which

tests the overall validity of the instruments by analyzing the sample analogue of the moment conditions used in the estimation process. If the moment condition holds, then the instrument is valid, and the model has been correctly specified. Second, it is important to test that there is no serial correlation among the transformed error term. Third, to test the validity of extra moment's conditions on the system GMM, the difference in Hansen test is used. This test measures the difference between the Hansen statistic generated from the system GMM and the difference GMM. Failure to reject the three null hypotheses gives support to the estimated model.

EMPIRICAL ANALYSIS

For the results to be valid, the banking sector should be in the long run equilibrium during the period of test. Following Claessens and Laeven (2004) and Utrero-Gonzalez (2004), this study has computed the dependent variable as ln(1 + ROA). Table 1 shows that the equilibrium in the banking sector is examined by estimating the equations (8). By applying the Wald F-test to the models, the results have rejected the null hypothesis of long run equilibrium at 1% significant level. The sum of the input price elasticities of the factors, are significantly different from zero for all specifications. The Wald test does not reject the null hypothesis $H = 0$, which indicates that Jordan and the GCC banking sector were in the long-run equilibrium over the period 2003 to 2010.

As this study focuses on the competition level in Jordan and in the GCC banking sector, the empirical results of this study show the degree of competition and type of market structure based on several methods, e.g. static (fixed effect and dynamic GMM (difference and system).

Table 2 reports the results of fixed effect model for the individual countries. It shows that the value of *H* statistic in Jordan is 0.67, Bahrain 0.73, Qatar 0.18, UAE 0.29, Saudi Arabia 0.32, Kuwait 0.66, and Oman (-.34). The above results indicate that all the countries except Oman are operating under a monopolistic condition. In the case of Oman, the banking sector is clearly operating under a monopoly market since its H value is negative.

The results of this paper are consistent with Al-Muharrami et al. (2006) in which suggested that competitive condition, monopolistic competition and monopoly exist within the GCC economies. Their findings showed the existence of monopolistic competition in Bahrain and Qatar. The banking sectors in Kuwait, Saudi Arabia and UAE have adopted perfect competition. This could be explained either by the presence of the foreign banks in these countries or the preparation of these three countries (Kuwait, Saudi Arabia and UAE) for entering the World Trade Organization (WTO) and the implications of 'threat of entry'. The banking sector in Oman generated its revenue under monopoly. This could be due to the fact that anti-monopoly legislation in Oman is poorly developed.

Table 3 shows the estimated revenue function for the total sample of Jordan and the GCC countries, using

TABLE 1. Equilibrium test results (Depended variable-*ln* ROA)

	One step System			Two step System		
Variables	Coefficient	Std. Err.	*P* Value	Coefficient	Std. Err.	*P* value
ln $(ROA)_{t-1}$	0.635	0.202	0.00***	0.783	0.126	0.00***
ln PF	0.120	0.084	0.15	0.085	0.085	0.31
ln PL	–0.051	0.149	0.73	–0.060	0.134	0.65
ln PK	–0.051	0.091	0.57	–0.028	0.079	0.71
ln ASSET	0.082	0.172	0.63	0.0614	0.169	0.71
ln EQUITY	–0.113	0.105	0.27	–0.099	0.097	0.30
ln LOAN	–0.149	0.134	0.26	–0.083	0.101	0.41
ln FIXED	0.087	0.138	0.52	0.028	0.074	0.70
E Statistic	0.01			0.00		
Hansen test	3.16		0.67	3.16		0.67
Difference (null H = exogenous):	1.29		0.25	1.29		0.25
AR(1)	–2.23		0.02***	–2.83		0.00***
AR(2)	0.39		0.69	0.49		0.62
No. of instruments	21			21		
No. of groups	88			88		
No. of observation	465			465		
Wald chi2	132.59		0.00***	169.28		0.00***
Market Condition	Equilibrium			Equilibrium		

*Significant at 10%, **Significant at 5%, ***Significant at 1%

TABLE 2. Fixed Effect Model for Panzar and Rosse

	Jordan	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
Variables	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
ln PF	0.021	0.114	0.109	–0.346	0.191	0.043	0.230
	(1.27)	(1.12)	(1.02)	(–2.96)***	(2.10)**	(0.74)	(2.08)**
ln PL	0.338	–0.136	0.330	–0.770	0.169	0.125	1.484
	(5.42)***	(–0.58)	(1.33)	(–4.20)***	(0.31)	(0.34)	(3.46)***
ln PK	0.319	0.756	0.228	0.676	–0.176	0.158	–1.423
	(5.18)***	(3.23)***	(0.95)	(2.15)**	(–0.28)	(0.56)	(–3.57)***
ln ASSET	0.615	0.0621	–0.475	0.465	1.206	–1.293	1.699
	(–10.22)***	(0.18)	(–1.02)	(2.41)**	(2.00)**	(–2.21)**	(3.52)***
ln EQUITY	0.536	0.452	1.070	0.431	0.583	0.782	0.459
	(12.56)***	(2.21)**	(2.77)***	(2.01)**	(3.14)***	(3.31)***	(2.18)**
ln LOAN	0.361	–0.254	0.092	0.159	–0.403	0.398	0.174
	(12.08)***	(–3.60)***	(0.58)	(0.46)	(–1.14)	(1.51)	(0.52)
ln FIXED	0.516	0.708	0.134	0.485	–0.506	0.014	–1.389
	(9.36)***	(3.24)***	(0.54)	(1.56)	(–0.82)	(0.04)	(–3.50)***
H Value	0.67	0.73	0.66	–0.34	0.18	0.32	0.29
F test H = 0	68.22	5.93	33.56	30.78	0.02	0.08	0.04
P value	(0.00)***	(0.00)***	(0.00)***	(0.00)***	(0.89)	(0.77)	(0.84)
F-statistic	22.94	2.69	2.55	4.39	7.44	3.27	3.74
Adj. R^2	0.97	0.47	0.69	0.89	0.79	0.11	0.68
Competitive Condition	Monopolistic Competition	Monopolistic competition	Monopolistic competition	Monopoly	Monopolistic competition	Monopolistic competition	Monopolistic competition

*Significant at 10% , **Significant at 5% , ***Significant at 1%

both fixed and random effect in Panzar and Rosse model. The fixed effects test in the second column shows a *H* value of 0.40, which indicates that the market structure operates under monopolistic competition. Similarly, random effects test in column 5 shows a *H* value of 0.27. This finding describes that the market structure of Jordan and GCC banking system during the sample period as monopolistically competitive.

The results in Table 3 are consistent with earlier studies, which used the Panzar and Rosse model; where these studies found monopolistic competition in the banking sector. For example, Molyneux and Forbes (1995) and Bikker and Haaf (2002) found improved competition in 1998 and between the beginning and the end of the 1990s. Claessens and Laeven (2004) found relatively strong competition during the 1990s, while Casu and Girardone (2006) estimated a relatively low level of competition with *H*-statistic of around 0.3. While the different estimates of *H* could be attributed to the variation of sample periods and sample size, the established view is that the Jordan and the GCC banking sector is one of monopolistic competition.

As for the other explanatory variables in Table 3, ASSET and LOAN take a positive and significant coefficient. As expected, bigger bank and higher share of loans play an important role in generating revenues. In contrast, the ratio of equity to total assets does not influence banks' income, as its coefficient is not statistically different from zero.

Apart from the results of static panel, this study also reports the estimation results using dynamic panel for robustness, checking to assess the degree of competition in Jordan and in the GCC banking sector. Table 4 shows the estimated values of *H* based on equation (10), with results for the one-step estimator as well as the robust one-step estimator. Table 4 describes the estimates for total revenue as the dependent variable. From these columns one could observe that of the three input prices, the unit price of funds (*PF*) is significant at conventional levels of significance, suggesting that the cost of funds is an important contributor to total income. The *H* value is 0.225 and similarly the two-step difference in column 5 shows that the *H* value is 0.447. These indicate that, the market structure in Jordan and in the GCC countries operate under monopolistic competition.

The results in Table 4 and 5 show that the AR (2) for testing the serial correlation and the Hansen test for testing the validity of instrument adopted are also valid. As shown, the *p* values for the AR(2) and Hansen tests are higher than 0.10, that is, statistically insignificant at the 1% significance level. These imply that the instrument adoption is valid because there is no serial correlation (autocorrelation) in the transformed residuals, and the instruments (moment conditions) used in the models are valid. The one step and two step system in Table 5 shows that the AR(2) for testing the serial correlation and the Hansen test for testing the validity of instrument adopted, are also valid. In the one-step system, the *p* value for the

TABLE 3. Panzar and Rosse model for Jordan and GCC banking market

	Fixed effect			Random effect		
Variables	Coefficient	Std. Err.	*t* value	Coefficient	Std. Err.	*Z* value
Intercept	–2.824	0 .657	(–4.29)***	–2.625	0 .531	(–4.94)***
ln PF	0. 282	0.038	(5.96)***	0.265	0.046	(5.66)***
ln PL	0 .285	0.065	(3.13)***	0.262	0. 057	(4.53)***
ln PK	–0.165	0.081	(–2.13)**	–0.257	0. 072	(–3.56)***
ln ASSET	0 .427	0.106	(4.21)***	0.370	0. 101	(3.66)***
ln EQUITY	0 .532	0.090	(6.27)***	0.640	0. 081	(7.85)***
ln LOAN	0 .119	0.069	(2.04)**	0. 132	0. 058	(2.26)***
ln FIXED	–0.140	0.076	(–1.70)*	–0. 180	0. 081	(–2.21)**
H Value	0.40			0.27		
F test H = 0	13.37		(0.00) ***	31.15		(0.00) ***
F Statistic	87.82					
Adj. R^2	0.856			0.866		
No. of Obs.	638			638		
No. of Group	90			90		
Competitive Condition	Monopolistic Competition			Monopolistic Competition		

Note: "*t*" and '*z*' values are in parenthesis
*Significant at 10% , **Significant at 5% , ***Significant at 1%

TABLE 4. Panzar and Rosse Dynamic panel-data estimation, GMM

	One step Difference			Two step Difference		
Variables	Coefficient	Std. Err.	*P* Value	Coefficient	Std. Err.	*P* value
ln (Rev)t–1	0 .384	0.439	(0.38)	0.124	0.100	(0.21)
ln PF	0 .271	0 .107	(0.01)***	0.287	0.039	(0.00)***
ln PL	0 .187	0 .195	(0.33)	0.318	0.094	(0.00)***
ln PK	–0.233	0 .146	(0.11)	–0.158	0.091	(0.08)*
ln ASSET	0 .409	0 .146	(0.00)***	0 .341	0.116	(0.00)***
ln EQUITY	0 .546	0 .098	(0.00)***	0.577	0.101	(0.00)***
ln LOAN	0 .104	0 .087	(0.23)	0.127	0.077	(0.10)
ln FIXED	–0.266	0.203	(0.19)	–0.174	0.088	(0.04)**
H Value	0.225			0.447		
Hansen test	3.14		(0.67)	14.07		(0.29)
Difference (null H = exogenous):	6.23		(0.28)	5.93		(0.54)
AR(1)	–1.41		(0.02)**	–2.42		(0.01)***
AR(2)	–0.36		(0.72)	–0.86		(0.39)
F test H = 0	0.32		(0.57)	8.11		(0.00)***
No. of instruments	13			27		
No. of groups	87			87		
No. of observation	458			458		
Wald chi2	791.17		(0.00)***	1246.04		(0.00)***
Competitive Condition	Monopolistic Competition			Monopolistic Competition		

***, **, * Significant at 1%, 5%, and 10%, respectively;
P-values in parenthesis
H-value is the estimated Rosse-Panzar's *H*-statistic
Sargan is the *p*-value for the Sargan test for the validity of the over-identifying restrictions for the GMM estimates
AR(2) is the *p*-value for the test for 2nd order autocorrelation for the GMM first-difference estimate residuals

AR(2) is 0.64 and Hansen tests is 0.18 which is higher than 0.10, that is, statistically insignificant at the 10% significance level. Similarly in the two-step system, the results of AR(2) and Hansen test imply that the instrument adoption is valid because there is no serial correlation (autocorrelation) in the transformed residuals, and the instruments (moment conditions) used in the models are valid. Whereas the *H* value of 0.742 in column 2 and 0.664 in column 5, indicate that the market structure of Jordan and the GCC's banking sectors operate under monopolistic competition.

Overall, the consistent results in Table 2 – Table 5 that indicate competitive conditions confirm that almost all the estimated coefficients are statistically significant at the 1% level. All the tests also confirm the good fit of models. The F-statistics for testing the hypotheses *H*=0 and *H*=1 indicate that we could reject the null hypotheses at 1% level of significance for all estimations. The estimation for the test statistic *H* is significantly positive for the overall sample. These results suggest that the value of the test statistic *H* is positive and statistically different from 0 and unity, rejecting both the monopoly and perfect competition hypotheses. The economic interpretation of these statistics is that banks in Jordan and in the GCC are actually operating under monopolistic competition.

With regard to the coefficients on the bank specific factors for the pooled sample, the sign on the size coefficient (TA) is positive and significant in some cases, suggesting that size differentials in assets among banks lead to higher total revenues per dollar of assets for the larger banks. Another significant variable with positive coefficient is the loan, and it suggests that banks with a higher proportion of lending in their total liabilities are able to generate higher interest revenues. The risk coefficient, (EQTY), is not significant in most cases and has the expected negative sign, indicating that banks with low proportion of equity capital (riskier banks) are able to generate higher income per dollar of their assets.

Overall, the results are consistent with the expectation that globalization and deregulation of financial markets, together with the adoption of new technology have increased the competitive conditions in Jordan and in the GCC banking markets.

SUMMARY AND CONCLUSIONS

This paper provides new empirical evidence on the market structure and the level of banking competition in Jordan relative to the six GCC by using the Panzar and Rosse (1987) model. Two panel data approaches namely,

TABLE 5. Panzar and Rosse Dynamic panel-data estimation, GMM

	One step System			Two step System		
Variables	Coefficient	Std. Err.	*P* Value	Coefficient	Std. Err.	*P* value
ln $(Rev)_{t-1}$	0.079	0.091	(0.38)	0.084	0.091	(0.35)
ln PF	0.330	0.062	(0.00)***	0.261	0.052	(0.00)***
ln PL	0.437	0.119	(0.00)***	0.445	0.121	(0.00)***
ln PK	–0.025	0.136	(0.85)	–0.042	0.158	(0.78)
ln ASSET	–0.010	0 .286	(0.97)	0.118	0.225	(0.60)
ln EQUITY	0.637	0.138	(0.00)***	0.598	0.141	(0.00)***
ln LOAN	0.333	0.141	(0.01)***	0.263	0.130	(0.04)**
ln FIXED	0.007	0.155	(0.05)**	–0.028	0165	(0.86)
H Value	0.742			0.664		
Hansen test	7.45		(0.18)	7.45		(0.18)
Difference (null H = exogenous):	5.66		(0.46)	5.66		(0.46)
AR(1)	–2.74		(0.00)***	–2.52		(0.01)***
AR(2)	–0.46		(0.64)	–0.53		(0.59)
F test H = 0	11.59		(0.00)***	8.37		(0.00)***
No. of instruments	26			26		
No. of groups	90			90		
No. of observation	548			548		
Wald chi2	8069.54		(0.00)***	9123.80		(0.00)***
Competitive Condition	Monopolistic Competition			Monopolistic Competition		

***, **, * Significant at 1%, 5%, and 10%, respectively;
P-values in parenthesis
H-value is the estimated Rosse-Panzar's *H*-statistic
Sargan is the *p*-value for the Sargan test for the validity of the over-identifying restrictions for the GMM estimates
AR(2) is the *p*-value for the test for 2nd order autocorrelation for the GMM first-difference estimate residuals

fixed effect and dynamic panel GMM estimators are used in evaluating the *H*-statistic for the sample period of 2003-2010.

The empirical results based on static panel (fixed and random effect) and dynamic panel GMM estimator reveal that all the countries are operating under monopolistic competition except for Oman in which its banking sector is operating under monopoly condition. The results also indicate that the estimated *H*-statistics for the sample period are positive and the Wald test for either monopoly or perfect competition market structure is rejected. Thus, the findings indicate that banks in Jordan and in the GCC countries generate revenue under the condition of monopolistic competition. Therefore, the Jordanian government is ready to join the GCC group as its banks have the ability to compete with the banking sector in the GCC countries.

The findings draw attention to the critical role of the expected union among the countries under study in increasing competition in the banking sector. It is therefore important for the authorities in Jordan and GCC to initiate more measures to enhance competition, to encourage banks to be more profitable and reduce non-performing loans in the union. However changes in the competition levels must be controlled, as high level competition pushes banks to accept risky clients and a low level does not encourage banks to improve their services and gain more market share. In other words, the findings imply that the union benefits the GCC countries and Jordan because they would be obliged to fulfill the requirements for cooperation among banks. Moreover, it is advisable for the decision makers and authorities in Oman to promote competition in the market and to enhance the banking sector to be as competitive as the other union members.

There is a need to pay greater attention to the market condition in the banking sector within the union members. This is because the soundness and stability of the financial sector in many ways are influenced by the degree of competition. Maintaining the health of the financial system is currently one of the key objectives of bank supervisors. Needless to say, the formation of a union between the GCC and Jordan is probably the best cause of action in order to achieve greater competitive and efficiency levels at the global arena.

NOTA

1 Since 1990s, there are major changes in the Jordanian banking sector in terms of privatization of banks, adapting to new technology, liberalization of the interest rates and financial deregulation.

REFERENCES

Al-Muharrami, S., Matthews, K. & Khabari, Y. 2006. Market Structure and Competitive Conditions in the Arab Gcc Banking System. *Journal of Banking & Finance* 30(12): 3487-3501.

Alonso-Borrego, C. & Arellano, M. 1999. Symmetrically Normalized Instrumental-Variable Estimation Using Panel Data. *Journal of Business & Economic Statistics* 17(1): 36-49.

Arellano, M. & Bond, S. 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies* 58(2): 277-297.

Arellano, M. & Bover, O. 1995. Another Look at the Instrumental Variable Estimation of Error-Components Models. *Journal of econometrics* 68(1): 29-51.

Azman-Saini, W.N.W., Baharumshah, A.Z., and Law, S.H. 2010. Foreign direct investment, economic freedom and economic growth: International evidence. *Economic Modelling*, 27:1079-1089.

Batchelor, V. B. 2005. A Comparable Cross-System Bank Productivity Measure: Empirical Evidence from the Malaysian Dual Banking System.

Baumol, W. J. 1982. Contestable Markets: An Uprising in the Theory of Industry Structure. *American Economic Review* 72(1): 1-15.

Beck, T. & Levine, R. 2004. Stock Markets,Banks, and Growth: Panel Evidence. *Journal of Banking and Finance* 58(423-442).

Berger, A. N., Demsetz, R. S. & Strahan, P. E. 1999. The Consolidation of the Financial Services Industry: Causes, Consequences, and Implications for the Future. *Journal of Banking & Finance* 23(2): 135-194.

Berger, A. N., Klapper, L. F. & Turk-Ariss, R. 2009. Bank Competition and Financial Stability. *Journal of Financial Services Research* 35(2): 99-118.

Bikker, J. A. & Haaf, K. 2002. Competition, Concentration and Their Relationship: An Empirical Analysis of the Banking Industry. *Journal of Banking & Finance* 26(11): 2191-2214.

Bikker, J. A., Shaffer, S. & Spierdijk, L. 2009. Assessing Competition with the Panzar-Rosse Model: The Role of Scale, Costs, and Equilibrium. *Review of Economics and Statistics* 0):

Bikker, J. A., Spierdijk, L. & Finnie, P. 2006. *Misspecifiation of the Panzar-Rosse Model: Assessing Competition in the Banking Industry*. De Nederlandsche Bank.

Blundell, R. & Bond, S. 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of econometrics* 87(1): 115-143.

Calderon, C. A., Chong, A. & Loayza, N. V. 2002. Determinants of Current Account Deficits in Developing Countries. *Contribution to Macroeconomics* 2(1): 1-31.

Cardovic, C. A. & Levine, R. 2005. Does Foreign Direct Investment Accelerate Economic Growth? Dlm. Moran, T., Graham, E. & Blomstrom, M. (pnyt.). *Does Foreign Direct Investment Promote Development,* hlm. 195-220. Washington, DC: Institute for International Economics and Center for Global Development.

Casu, B. & Girardone, C. 2006. Bank Competition, Concentration and Efficiency in the Single European Market*. *The Manchester School* 74(4): 441-468.

Claessens, S., Demirgüç-Kunt, A. & Huizinga, H. 2001. How Does Foreign Entry Affect Domestic Banking Markets? *Journal of Banking & Finance* 25(5): 891-911.

Claessens, S. & Laeven, L. 2004. What Drives Bank Competition? Some International Evidence. *Journal of Money, Credit and Banking* 563-583.

Daley, J. & Matthews, K. 2012. Competitive Conditions in the Jamaican Banking Market 1998–2009. *International Review of Financial Analysis*

De Bandt, O. & Davis, E. P. 2000. Competition, Contestability and Market Structure in European Banking Sectors on the Eve of Emu. *Journal of Banking & Finance* 24(6): 1045-1066.

Dietsch, M. & Lozano-Vivas, A. 2000. How the Environment Determines Banking Efficiency: A Comparison between French and Spanish Industries. *Journal of Banking & Finance* 24(6): 985-1004.

Goddard, J., Molyneux, P. & Wilson, J. O. S. 2001. *European Banking: Technology, Efficiency and Growth*. John Wiley & Sons.

Goddard, J. & Wilson, J. O. S. 2009. Competition in Banking: A Disequilibrium Approach. *Journal of Banking & Finance* 33(12): 2282-2292.

Hart, O. D. 1983. The Market Mechanism as an Incentive Scheme. *The Bell Journal of Economics* 366-382.

Hauner, D. & Peiris, S. 2005. Bank Efficiency and Competition in Low-Income Countries: The Case of Uganda.

Hondroyiannis, G., Lolos, S. & Papapetrou, E. 1999. Assessing Competitive Conditions in the Greek Banking System. *Journal of International Financial Markets, Institutions and Money* 9(4): 377-391.

Karim, Z.A. 2012. Monetary Policy Effects on Investment Spending: A Firm-Level Study of Malaysia. Studies in Economics and Finance, Vol 29(4): 268-286.

Karim, Z. A. & Azman-Saini, W. 2013. Firm-Level Investment and Monetary Policy in Malaysia: Do the Interest Rate and Broad Credit Channels Matter? *Journal of the Asia Pacific Economy*, Vol 18(3): 396-412.

Karim, Z. A., Azman-Saini, W. & Karim, B. A. 2011. Bank Lending Channel of Monetary Policy: Dynamic Panel Data Study of Malaysia. *Journal of Asia-Pacific Business* 12(3): 225-243.

Matthews, K., Murinde, V. & Zhao, T. 2007. Competitive Conditions among the Major British Banks. *Journal of Banking & Finance* 31(7): 2025-2042.

Merton, R. C. & Bodie, Z. 1995. A Conceptual Framework for Analyzing the Financial Environment. *The global financial system: A functional perspective* 3-31.

Mkrtchyan, A. 2005. The Evolution of Competition in Banking in a Transition Economy: An Application of the Panzar-Rosse Model to Armenia. *The European Journal of Comparative Economics* 2(1): 67-82.

Molyneux, P. & Forbes, W. 1995. Market Structure and Performance in European Banking. *Applied Economics* 27(2): 155-159.

Molyneux, P., Thornton, J. & Michael Llyod-Williams, D. 1996. Competition and Market Contestability in Japanese Commercial Banking. *Journal of Economics and Business* 48(1): 33-45.

Nathan, A. & Neave, E. H. 1989. Competition and Contestability in Canada's Financial System: Empirical Results. *Canadian Journal of Economics* 576-594.

Nickell, S. 1981. Biases in Dynamic Models with Fixed Effects. *Econometrica: Journal of the Econometric Society* 1417-1426.

Panzar, J. C. & Rosse, J. N. 1982. *Structure, Conduct, and Comparative Statistics*. Bell Telephone Laboratories, Incorporated.

Panzar, J. C. & Rosse, J. N. 1987. Testing for" Monopoly" Equilibrium. *The Journal of Industrial Economics* 443-456.

Panzar, J. C. & Willig, R. D. 1982. Contestable Markets and the Theory of Industry Structure. *New York*

Perrakis, S. 1991. Assessing Competition in Canada's Financial System: A Note. *Canadian Journal of Economics* 727-732.

Roodman, D. 2009. A Note on the Theme of Too Many Instruments*. *Oxford Bulletin of Economics and Statistics* 71(1): 135-158.

Roodman, D. 2009. Practitioners' Corner: A Note on the Theme of Too Many Instruments. *Oxford Bulletin of Economics and Statistics* 71(1): 135-158.

Rosse, J. N. & Panzar, J. C. 1977. *Chamberlin Vs. Robinson: An Empirical Test for Monopoly Rents*. Bell Laboratories.

Shaffer, S. 1982. A Non-Structural Test for Competition in Financial Markets. *Bank Structure and Competition, Conference Proceedings*, hlm. 225-243.

Shaffer, S. 1985. Competition, Economies of Scale, and Diversity of Firm Sizes. *Applied Economics* 17(3): 467-476.

Shaffer, S. 1993. A Test of Competition in Canadian Banking. *Journal of Money, Credit and Banking* 25(1): 49-61.

Shaffer, S. 2004. Comment on" What Drives Bank Competition? Some International Evidence" by Stijn Claessens and Luc Laeven. *Journal of Money, Credit and Banking* 36(3): 585-592.

Staikouras, C. K. & Koutsomanoli-Fillipaki, A. 2006. Competition and Concentration in the New European Banking Landscape. *European Financial Management* 12(3): 443-482.

Turk Ariss, R. 2010. On the Implications of Market Power in Banking: Evidence from Developing Countries. *Journal of Banking & Finance* 34(4): 765-775.

Utrero-Gonzalez, N. 2004. Banking Competition in Uk and Spain: Is There a Euro Effect? *FMA European Conference*, hlm. 3-4.

Yildirim, H. S. & Philippatos, G. C. 2007. Restructuring, Consolidation and Competition in Latin American Banking Markets. *Journal of Banking & Finance* 31(3): 629-639.

Anwar Salameh Gasaymeh*
Zulkefly Abdul Karim**
Mariani Abdul Majid***
Mansor Jusoh****
School of Economics
Faculty of Economics and Management
Universiti Kebangsaan Malaysia
43600 Bangi, Selangor
MALAYSIA

*gasaymeh@yahoo.com
**zak1972@ukm.edu.my
***mariani@ukm.edu.my
****mansorj@ukm.edu.my