

Competitive Environment in Banking Industry: Evidence from an Emerging Economy

Abdul Rafay¹, Saqib Farid²

Abstract

The study investigates competitive conditions in commercial banking sector of Pakistan. The study employs a measure of estimating banking competition derived from modified Panzar and Rosse Model – The PR Model. The data was obtained from annual financial statements of 22 commercial banks listed on Pakistan Stock Exchange (PSX) for the period 2007-2016. The H-statistic for commercial banking sector is calculated through three different estimation methods (OLS, GLS fixed effects and GMM). The results depict monopolistic competition and significant role of bank size in determining the level of competition in commercial banking sector of Pakistan. The empirical evidence unveils that more competition exists between smaller banks as compared to larger banks. Further, speed of adjustment in profits with respect to factor input prices is better in smaller banks as compared to their larger counterparts. The findings imply that the speed adjustment process is slow, which allows commercial banks in Pakistan to accumulate abnormal profits.

JEL Classifications: L11, N20

Keywords: Banking competition, H-statistic, PR model

1. Introduction

A dynamic financial system is essential for a stable and efficient economic structure. A typical financial system contains financial institutions, financial markets, clearing and settlement houses. Particularly, banks play a crucial role in development and progression of an economy. A stable banking sector reinforces economic efficiency and stability, and promotes social welfare through allocating funds and offering other financial services to the households and firms. The customary functions of banking industry involve provision and extension of credit for customers, risk sharing and channelizing saving for productive investments. Productive functioning of banking sector promotes financial stability and economic growth (King & Levine, 1993). Con-

¹ Professor, School of Business and Economics, University of Management and Technology (UMT), Pakistan.
Email: abdul.rafay@umt.edu.pk

² Lecturer School of Business and Economics, University of Management and Technology (UMT), Pakistan.

ARTICLE HISTORY

23 May, 2018 Submission Received

27 June, 2018 First Review

4 Aug, 2018 Second Review

18 Sep, 2018 Third Review

28 Sep, 2018 Accepted

trary, sub-standard banking creates financial instability that adversely impacts other industries. Conventionally, banking sector is regarded more un-shielded to risks as compared to other industries. The various reasons include high leverage, onerous in liquidating long term assets and presence of deposit insurance for depositors (Northcott, 2004). Moreover, unstable banking sector is not only an intra-industry hazardous phenomenon, but it also has debilitating effects on the other sectors. Additionally, failure of banking sector creates considerable costs for an economy. In an economy shock of banking failure passes to other sectors through multiple networks.

As a service industry, banking sector adds value to economy by providing means for facilitating production of real items in other industries. An efficient and competitive banking sector is pivotal for innovation, quality and delivery of real goods. Intra-industry competition is generally regarded as a favorable situation. An optimal level of competition is imperative to achieve Allocative Efficiency³ and Productive Efficiency⁴. From customer perspective, competition in banking sector prompts beneficent rivalry among banks that results in better price and quality of financial services, up-graded technology and enhanced managerial skills.

Competition in the banking industry is extensively and repeatedly debated. Scrupulous review of the literature unveils lack of consensus in explaining the relationships between competitiveness, banking performance and market power. Theoretical literature on banking competition presents trade-off between growth and stability. The underlying rationale promulgates that a competitive industry is efficient, but a certain level of market power is also imperative for the stability of the industry. As mentioned earlier, in a competitive environment intermediation cost reduces for the households and enterprises which increases productive efficiency and translates into higher economic growth. However, the least market power⁵ can also cause lower profits which ultimately impact the ability of a bank to endure in times of financial crunch.

A large number of studies on banking structure have discussed the trade-off between efficiency and stability in banking markets around the world. The viewpoint that increased competition is unambiguously beneficial in banking is more naive than in other industries (Claessens & Laeven, 2004). However, intra-industry competition is assumed to drive readily available supply of credit at lower costs. Contrary, policy makers around the world have anchored on stable banking sector with certain level of market power. This consequently caused development of policies that restricted competition in different banking sectors around the world (Padoa-Schioppa, 2001).

³ Allocative efficiency means value added by banking sector through boosting capital accumulation for supply of loans (See Northcott, 2004).

⁴ Productive efficiency means achieving maximum output with minimum inputs (See Northcott, 2004).

⁵ Market Power refers to the capacity of the single firm to influence the price of goods and services.

Rapid enhancement in technology, globalization and financial crises has spearheaded the idea of optimal banking structure. The notion supports competitive environment with minimum potential loss of market power by retaining left over gains of market power in banking (Northcott, 2004). The earlier evidence depicts two major hypotheses that unveil the association between market power and stability. Firstly, competition-fragility hypothesis outlines positive relationship between competition and stability. Conversely, the 'competition-stability' hypothesis states that banks with higher market concentration take fewer risks. A large number of studies have documented evidence following both hypotheses⁶. However, the regulatory reforms adopted by different countries in post financial crisis again ignited the debate of market power and stability. Due to major structural changes the banking competition has evolved and it holds major implications for the overall stability of banking sector.

Financial crisis of 2008-09 has further intensified this debate on the relationship between bank competition and bank stability. Martinez-Miera and Repullo (2010) present a distinct view and argue that the underlying relationship is U-shaped. Nevertheless, the financial crisis depicts that still considerable research needs to be carried out to unveil the true association between bank competition and bank efficiency and stability. Moreover, the crisis has largely shaken critical assumptions about the financial market structures. In this context, it is crucial to reinvestigate the implications of market power on banking stability and efficiency. Earlier research has identified the three major strands of hypotheses to determine the link between banking competition and efficiency. The first hypothesis 'quiet life' state that competition enhances cost efficiency. Berger and Hannan (1998) showed that in US banking sector, in absence of competition banks tend to be less efficient. Conversely, the second hypothesis 'efficient-structure' asserts that cost efficiency decreases competition (Demsetz, Saldenberg & Strahan, 1996). The logic stipulates that the efficient banks have large market share which causes high market concentration. Furthermore, the third hypothesis 'The banking specificities' argues that competition has negative impact on cost efficiency, as the higher degree of competition can decrease the length of customer relationship due to information asymmetries. This can consequently augment costs for the lenders.

Post financial crisis 2007-08 banking competition is still among most widely debated issues in banking literature. Studies on banking competition have covered both developed and developing economies. Few studies have also focused on cross-country and regional comparison of banking competition (Claessens & Laeven, 2004; Bikker & Haaf, 2002; Bikker, Shaffer & Spierdijk, 2012). However, there is lack of consensus about the degree of influence of banking competition on financial stability. This study

⁶ For competition-fragility hypothesis see (e.g., Marcus, 1984; Keeley, 1990; Demsetz et al., 1996; Hellmann et al., 2000; Boyd et al., 2004). For competition-stability hypothesis see (e.g., De Nicoló et al., 2006; Kane, 2010; Rosenblum, 2011; Anginer et al., 2012)

is an effort to apply the modified version of Panzar and Rosse (1987) to assess the competitive conditions in commercial banking sector of Pakistan. In a country like Pakistan with weak capital market, the banking sector serves as the main provider of credit for other industries. Therefore, it is vital to investigate the degree of competition and its implications for the efficiency and stability of the banking in Pakistan during the post financial crises period. In particular after the implementation of Basel III the banking industry has went down under significant structural changes. Following Basel III guidelines SBP has introduced reforms in domains of asset quality and non-performing loans to ensure adequate degree of liquidity and leverage levels are maintained by the banks. The study uses direct efficiency measuring approach by estimating the efficiency of a bank with respect to factor input and output prices and comparing them with other participating banks in the sector. Banking sector in Pakistan is one of the most dynamic and rapidly growing sectors in the economy. In year 2015-16 the overall banking sector grew at the rate of 6.1%. However, as compared to similar emerging economies the sector is still very minute. The statistics for the similar period also depict that services sector in Pakistan constitutes around 55% of the total GDP and the financial sector only contributes 5.3% to the overall value of services.

Although, the banking industry in Pakistan is often praised for its swift growth, but high spreads and concentrated structure has always has raised critical policy issues about the industry competitiveness. At the end of 2015 the profits of banking industry grew at the rate of 12% despite the new regulatory measures introduced by Ministry of Finance and State Bank of Pakistan (SBP). The banking sector in Pakistan is generally represented by dominating position of five large banks. In early 1990s the assets of top five banks accounted for 84% of the total assets of banking industry. However, due to banking reforms and increment in number of domestic banks, the banking sector has evolved significantly and in 2015 the total assets of five large banks accounted for 51.5% of the total assets of the banking sector. Policy makers in Pakistan are yet to find the equilibrium between liberalization and strong regulations in the industry. There is a dearth of empirical literature unveiling concentration and competition scenario in commercial banking sector of Pakistan. The only notable study on the underlying area is conducted by Khan (2009) in which researcher used conventional static Panzar and Rosse Model (PR Model) approach to estimate banking competition in Pakistan. To our knowledge no earlier study has employed dynamic approach to estimate banking competition in Pakistan. This study uses modified dynamic version of PR model derived from conventional PR model and Nerlove's (1956) partial adjustment model. The approach is used to avoid biases in revenue equation.

Amel and Liang (1990) showed that market profits play a crucial part in shaping up the speed adjustment process towards the market equilibrium. The study uses deviated

profits from average market profits as a proxy of market attractiveness. It is argued that the rate of adjustment to the equilibrium is greater if the market experiences extremely high or low profits. The speed of adjustment of profits to equilibrium also captures the financial stability of the sector. Moreover, the empirical evidence attained from the tests will also assist in evaluating whether commercial banks are accumulating normal profits or they are involved in collusion that cause market failure. These tests are also designed to assess the degree of competition between different types of banks (large vs. small). The examination of banking competition within different bank sizes will elucidate the true relationship between banking competition and stability. The insights from the study will assist policy makers to formulate prudent regulatory framework for commercial banks in Pakistan. The empirical examination of banking competition will highlight the potential threats to the stability of commercial banking in the country. This study will also provide foundations for extensive research regarding the factors driving banking competition in Pakistan. The recent evidence from this study will manifest how banking competition has changed over time in Pakistan. Our study also contributes to the literature that it uses data of commercial banking sector of Pakistan from crisis period to onwards. Moreover, the major structural changes post crisis is assumed to have significant impact on the competition scenario in banking sector of Pakistan. These facts also entail the need for recent inspection to establish the implication of banking competition for overall performance and stability of the banking industry in Pakistan.

In view of the above discussion following research questions have been formulated for the study.

- i. What is the level of profit deviation activities in commercial banking sector of Pakistan?
- ii. What is the degree of banking competition prevailing in commercial banking sector of Pakistan since financial crisis 2007?
- iii. Does the degree of banking competition differ for banks with different sizes (small vs. large)?

2. Literature Review

On the basis of methodology, the literature on banking competition can be divided into two major categories; studies under structural approach and non-structural approach. The genesis of structural approach comes from classical theory of Industrial Organization (IO) which deploys Structure Conduct Performance (SCP) mechanism (Baumol, Panzar & Willigaumo, 1983). The central argument of classical IO model asserts that high concentration in the industry causes lower competition. Structural

approach uses concentration ratios and Hirschman Herfindhal Index (HHI) to determine the level of industry competition (Berger & Hannan, 1989; Hannan 1991). However, the non-structural approach has evolved around new empirical industrial organization theory. The approach asserts that using market indicators such as concentration indexes and measures of size and profitability to assess banking competition does not accurately describe the competition. Aforementioned variables are shaped up by multiple macro-economic variables like taxation, judicial system and bank specific micro factors like risk preferences and scale of operations (Baumol et al., 1983). The theory suggests a structural contestable approach to estimate and assess the competitiveness of banking sector through actual conduct of the bank. Since the actual conduct of a bank is not only limited to market structure, but it is also influenced by industry entry barriers like foreign ownership, activity restrictions and level of competition with other financial intermediaries (Claessens & Laeven, 2004).

2.1. Empirical evidences for structural approach

Early studies on banking competition employed concentration ratios to determine the degree of competition within a banking market. The critical perception of structural approach is that increased concentration causes high prices and results in abnormal profits. Additionally, high market concentration also causes collusive and other non-competitive behavior. One of the pioneer studies under structural approach by Berger and Hannan (1989) was conducted in US. The study covered the time period from 1983-85. The primary purpose of the study was to examine the relationship between market power and profitability. The findings of the study were not conclusive, but an effort was made to distinguish between the effects of non-competitive pricing behavior from efficiency. Demsetz (1974), Smirlock (1985) and Evanoff and Fortier (1988) showed that abnormal profits in highly concentrated markets could be due to productive efficiency of large firms. Since, larger banks are more efficient that enables them to reduce costs, increase profits and claim larger share of the market. In a more recent study, Chortareas et al. (2011) investigated the relationship between market power and efficiency using HHI approach for Latin American banks. The evidence obtained corroborated efficient structure hypothesis for Latin American banks. However, Besanko and Thakor (1992) documented the lack of effectiveness of structural approach to determine banking competitiveness. They argued that threat of new entrant is a better proxy for market structure rather than bank size and profit margins. A large number of studies have extensively examined the banking competition using SCP and Relative Market Power (RMP) hypothesis models. The results of these earlier studies have been mixed and show lack of consensus about the superiority of one model over the other (Gilbert, 1984; Goddard, Molyneux & Wilson, 2001).

2.2. Empirical evidences for non-structural approach

The non-structural approach is based on the rationale that factors other than market concentration can influence the degree of competition in an industry and high level of competition can coexist in a market with high concentration. Contrary, collusive behavior can be sustained in market with greater number of participants. The general contest-ability hypothesis (Non-structural Model) proposed two types of test of contest-ability. Firstly, Bresnahan (1982) and Lau (1982) developed a general equilibrium model that was extended by Bresnahan (1989). In the model, equilibrium price for a firm is attained where marginal cost is equal to perceived marginal revenue. The model used simple and easy to calculate test statistic that measured market imperfection between absolute market power and perfect competition. The model was used by Shaffer (1989, 1993) to investigate banking competition in US and Canadian banking markets. However, alternative model was proposed by Rosse and Panzar (1977) and extended in Panzar and Rosse (1987). The model used firm level data to examine the magnitude to which degree of change in input prices is captured in revenue of a bank. The model calculates H-statistic (Degree of competition) between 0 and 1, where 1 implies Perfect competition, 0 implies collusive monopoly and less than 1 implies monopolistic competition. The model was used by Nathan and Neave (1989) to determine degree of competition in the US and Canadian banking markets. Moreover, a large strand of literature has investigated banking competition using H-statistic approach, particularly in developed markets (Molyneux, Lloyd-Williams & Thornton, 1994; Bikker & Groeneveld, 2000; De Bandt & Davis, 2000; Weill, 2004; Staikouras & Koutsomanoli-Fillipakiand, 2006). Another, body of literature has used Lerner index to examine banking competition in different banking markets. Contrary, to H-statistic Lerner index uses bank level data to estimate banking competition and the approach is deployed many recent studies (De Guevara & Maudos, 2004; Maudos & de Guevara, 2007; Carbó, Humphrey, Maudos, & Molyneux 2009; Delis, 2012).

Numerous studies on banking competition have employed PR model to test the banking competition. The findings of the diverse studies carried out in different regions were quite similar. The evidence supports monopolistic competition prevailing in most of the banking markets around the world. However, research in emerging markets is sparse and still needed. The Table A1 in the appendix depicts brief summary of the literature on banking competition under the methodology of PR-Model (H-statistic).

3. Data and Methodology

3.1. Data

The time period of the study is from 2007-16. The data is obtained from annual

financial statements of respective banks. The sample for the study includes commercial banks listed on Pakistan Stock Exchange (PSX). Currently, they are 23 commercial banks listed on the PSX. We drop three banks from our final sample because these banks were incorporated after 2007. Alternatively, we included two large non-listed commercial banks to the final sample that were operational in 2007. Based on the asset size criterion, banks with assets worth of more than PKR 1 trillion are classified as large commercial banks (five banks) and others are termed as small commercial banks (18 banks).

3.2. Empirical model

As explained in the previous section PR model (H-statistic) is widely employed methodology to estimate banking competition. The H-statistic for a bank is calculated from its revenue equations and the statistic computes total elasticities of revenue with respect to factor input prices. The sum of the elasticities is represented by symbol H and it is formally termed as H-statistic. The statistic measures the market power of the bank by changes in factor input prices reflected in the revenue equation. The interpretation for the H-statistic is as follows, where 1 implies perfect competition, 0 implies monopoly and value between 0 and 1 is interpreted as monopolistic competition. In this study we have derived H-statistic from the three different versions of revenue equation. Equation 1 is un-scaled revenue equation which excludes total assets as independent variable in the estimation. Equation 2 is a scaled equation and it incorporates total assets as independent variable in the model. PR model measures the market power of a bank with respect to factor input prices. We have calculated different ratios as proxies for factor input prices because factor input prices are not directly observable.

$$\ln(\Pi_{i,t}) = \alpha + \beta_1 \ln(W_{1,i,t}) + \beta_2 \ln(W_{2,i,t}) + \beta_3 \ln(W_{3,i,t}) + \gamma_1 \ln(Y_{1,i,t}) + \gamma_2 \ln(Y_{2,i,t}) + \varepsilon_{i,t} \quad (1)$$

$$\ln\left(\frac{TR_{i,t}}{TA_{i,t}}\right) = \alpha + \beta_1 \ln(W_{1,i,t}) + \beta_2 \ln(W_{2,i,t}) + \beta_3 \ln(W_{3,i,t}) + \gamma_1 \ln(Y_{1,i,t}) + \gamma_2 \ln(Y_{2,i,t}) + \gamma_3 \ln(Y_{3,i,t}) + \varepsilon_{i,t} \quad (2)$$

Where: $\ln(\Pi_{i,t})$ = Total interest income.

$\frac{TR}{TA}$ = Total interest income to total assets is used as proxy for output price of loans.

$W_{1,i,t}$ = Total interest expenses to total deposits is used as proxy for input price of deposits.

$W_{2,i,t}$ = Personnel expense over total assets is used as proxy for labor cost.

$W_{3,i,t}$ = Other operating expenses over total assets is used as proxy for input price

and other fixed capital.

$Y_{1,it}$ = Equity over total assets;

$Y_{2,it}$ = Net loans to total assets;

$Y_{3,it}$ = Total assets. $Y_{1,it}$, $Y_{2,it}$ and $Y_{3,it}$ is used as the control variable for bank-specific effect.

The sum of elasticities reduced with respect to factor input prices is calculated from above revenue equations. The sum of the elasticities is represented by a symbol H which is formally termed as H-statistic. The H-statistic is calculated by adding three coefficients estimated from above mentioned regression equations. Moreover, three coefficients illustrate the relationship between factor input prices and revenue equation of the bank.

$$H = \beta_1 + \beta_2 + \beta_3 \quad (3)$$

Where: β_1 is the coefficient of for input price of deposits.

β_2 is the coefficient of for input price for labor cost.

β_3 is the coefficient of for input price and other fixed capital.

H is the statistic that measures the market power.

3.3. Partial adjustment model

Bikker et al. (2012) argues that price equation and scaled revenue equation both produce non valid measures of banking competition. The un-scaled equation also requires additional information about the cost and market equilibrium to accurately estimate banking competition. In order to encounter the biases in conventional revenue equations, our model contributes to the existing literature by incorporating dynamic adjustment process to the conventional PR model. Moreover, the model estimates the effect of non-instantaneous adjustment on H statistic. This study also estimates the speed at which the banking profits of commercial banking sector of Pakistan adjusts to its long term equilibrium level. Theoretically, competitive banking sectors adjust to their long term equilibrium in an instantaneous manner. In this study we consider the speed of adjustment while measuring banking structure in Pakistan. As mentioned earlier to take into account the speed adjustment process while measuring banking structure for commercial banking sector in Pakistan, Nerlove's (1956) partial adjustment model is utilized. The theoretical framework of the model is rooted in accelerator model of economic theory.

Let $R_{i,t}$ be any economically relevant and observable variable which adjust to some desired but unobservable level $R^*_{i,t}$ as shown below:

$$R_{i,t} - R_{i,t-1} = \lambda(R^*_{i,t} - R_{i,t-1}) \quad (4)$$

By employing the partial adjustment model, the derived PR revenue equation is written below:

$$R_{i,t} = R_{i,t-1} + \lambda(R^*_{i,t} - R_{i,t-1}) = (1 - \lambda)R_{i,t-1} + \lambda R^*_{i,t} \quad (5)$$

$$R^*_{i,t} = \beta_1 \ln(W_{1,i,t}) + \beta_2 \ln(W_{2,i,t}) + \beta_3 \ln(W_{3,i,t}) + \gamma_1 \ln(Y_{1,i,t}) + \gamma_2 \ln(Y_{2,i,t}) + \gamma_3 \ln(Y_{3,i,t}) + \varepsilon_{i,t} \quad (6)$$

In our theoretical framework we have utilized all three variants of the revenue equation. Where λ demonstrates adjustment coefficient and DP is exhibited as measure of deviated profits. The linear form of the function is as follows

$$\lambda = \gamma_1 + \gamma_2 DP_{i,t} \quad (7)$$

In above equation speed adjustment coefficient is a function of deviated profits from normal industry profits. The deviated profits are defined as below

$$DP_{i,t} = \left\{ \frac{NetInterestIncome_{i,t}}{TotalAssets_{i,t}} - \frac{NetInterestIncome_{i,t}}{TotalAssets_{i,t}} \right\}^2 \quad (8)$$

The equation 8 is a convex function that shows the value of speed adjustment coefficient is directly proportional to the deviated profits. Further, we can interpret it as if the value of DP is high then market is in dis-equilibrium, hence the process of speed adjustment will also be high. Consequently, market will quickly move to attain the equilibrium state. Another reason to use squared deviations of profits is to avoid the problem of multi-collinearity. We used following equation to run our final regression:

$$R_{i,t} = (1 - \gamma_1 - \gamma_2 DP_{i,t})R_{i,t-1} + \left\{ \begin{array}{l} \beta_1 \ln(W_{1,i,t}) + \beta_2 \ln(W_{2,i,t}) + \\ \beta_3 \ln(W_{3,i,t}) + \gamma_1 \ln(Y_{1,i,t}) + \gamma_2 \ln(Y_{2,i,t}) + \gamma_3 \ln(Y_{3,i,t}) + \varepsilon_{i,t} \end{array} \right\} \quad (9)$$

Equation 9 is the final regression equation used to calculate H-statistic for commercial banking sector in Pakistan. The variables and coefficients used in estimating equation 9 are explained earlier in details of other mentioned equations. The final equation is derived from other equations explained earlier in the section. The final regression equation 9 is dynamic revenue equation that considers the effect of speed adjustment on PR revenue equation. It can be interpreted as if the deviated profits will be high the more affect will λ have on the factor input prices coefficients. Where on the other hand if deviated profits will be zero or markets are in equilibrium than λ will not affect the factor input prices coefficients. Additionally, the equation also explains that if deviated profits are significantly above zero than γ_2 will play its role in

correcting the biases in revenue equation. If deviated profits will be zero or markets are in equilibrium than only the γ_1 coefficient (constant) will be considered.

In addition to calculating the overall H-statistic for the commercial banking sector; the study has also separately calculated H-statistic for small commercial banks and large commercial banks. This approach will assist in reducing the risk arising from studying all banks together which can lead to distorted results. The distinction of size is based on the asset size of the bank. We use the bank classification scheme of SBP to list our sample banks into large and small category. The H-statistic is calculated through three different estimation methods OLS, GLS with fixed bank effects and GMM. Following Claessens and Laeven (2004), this study uses fixed effects with the underlying assumption of significant bank specific effects.

4. Results

Theoretically, higher speed of adjustment process towards market equilibrium reduces the possibility of abnormal profits. Consequently, the sector is regarded more stable with less likelihood to be involved in exorbitant risk activities. The estimates of equation (8) show that the average profit deviation (DP) for the commercial banking sector in Pakistan is 10.09. The results depict the average annual abnormal profits accumulated by banks with respect to factor input prices. Based on the DP estimates, the commercial banking sector of Pakistan could be categorized in markets with high profit deviation.

Table 1: Un-scaled Revenue Equation with Lambda Coefficient

Large Banks			Small Banks			Overall			
λ	H-statistic	SE	λ	H-statistic	SE	λ	H-statistic	SE	R ²
0.47	0.76*	0.003	0.78	0.79*	0.041	0.55	0.68*	0.052	.87

Notes: This table reports estimated values of lambda, H statistic and corresponding standard errors S.E. obtained by partial adjustment model for un-scaled revenue equation (excludes total assets $Y_{3,i,t}$ from control variables) (Bikker & Spierdijk, 2008).

*Refers to hypothesis testing at a (5% significance level) indicates the acceptance of $0 < H < 1$ (monopolistic competition).

In view of the results presented in the table 1, the degree of banking competition in Pakistan is classified as monopolistic competition. The average value of H-statistic for banking market is 0.68. The evidence documented by the earlier studies show that the value of H-statistic for most banking markets varies between 0.40 and 0.80. The results also reveal that banking competition has not necessarily increased after diverse regulation introduced after financial crisis in the sector to restore stability.

Using the similar approach, Bikker and Spierdijk (2008) showed that the mean value of H-statistic in South Asian region was around 0.64. The estimated results imply that the degree of banking competition in Pakistan is similar to other banking markets in the South Asian region. Additionally, the results are also in line with the banking literature that advocates the role of size in banking competition. Bikker et al (2006b) assert that larger banks have more market power as compared to their small counterparts which causes divergent level of banking competition in small and large banks. The estimates shown in the table 1 reveal that the H-statistic for small banks (0.79) is greater than the H-statistic for large banks (0.76).

The value of the speed adjustment coefficient of commercial banks in Pakistan is 0.55 shown in the table 1 which reflects slow instantaneous adjustment process towards long term equilibrium. The slow adjustment process is indicative of lower level of competitive environment in banking market. Since, the lambda value closer to 1 mirrors fast instantaneous adjustment process. Additionally, the results also illustrate that the lambda value for small banks (0.78) is greater than the lambda value of large banks (0.47). The results also demonstrate higher degree of banking competition in small banks as compared to large banks. The findings derived from results presented in table 1 support the notion that higher level of banking competition reinforces financial stability as markets with higher level of competitive environment adjust quickly towards equilibrium.

Table 2: FE Estimation with Scaled and Un-scaled Revenue Equation

Scaled revenue equation							Un-scaled revenue equation						
Large banks		Small banks		Overall			Large banks		Small banks		Overall		
H-stat	S.E	H-stat	S.E	H-stat	S.E	R2	H-stat	S.E	H-stat	S.E	H-stat	S.E	R2
0.56	0.7	0.79*	0.04	0.52*	0.04	.69	0.60*	0.07	0.59*	0.4	0.59*	0.04	.73

Notes: This table reports estimated values of H and corresponding standard errors S.E. obtained by fixed effect estimation for traditional scaled and un-scaled revenue equation for large and small banks

*Refers to hypothesis testing at a (5% significance level) indicates the acceptance of $0 < H < 1$ (monopolistic competition).

The estimated results of H-statistic calculated from GLS fixed effects illustrated in table 2 are also similar to our previous results. The H-statistic calculated from scaled revenue equation and non-scaled revenue equation is 0.52 and 0.59 respectively which falls under monopolistic competition. These results in table 2 also exhibit that higher level of competitiveness is prevailing between smaller commercial banks as compared to their large competitors.

Table 3: GMM Results for Scaled and Un-scaled Revenue Equation

Scaled revenue equation			Un-scaled revenue equation		
H-statistic	S.E	R2	H-statistic	S.E	R2
0.56*	0.03	.80	0.55*	0.26	.66

Notes: This table reports estimated values of H and corresponding standard errors S.E. obtained by (Arellano bond dynamic panel) GMM estimation for scaled and un-scaled revenue equation for large and small banks. The approach was used by Goddard and Wilson (2009)

*Refers to hypothesis testing at a (5% significance level) indicates the acceptance of $0 < H < 1$ (monopolistic competition).

The results attained from GMM estimation confirm the accuracy and robustness of our findings. Our GMM estimates displayed in table 3 show that the H-statistic for both scaled and non-scaled equation is 0.56 and 0.55 respectively. These results are concentrated with our earlier findings.

The mean value of H-statistic estimated using three diverse estimation techniques is 0.59 for banking market in Pakistan (See the table A2 in the appendix). The estimates are very close to India, another large regional economy in the South Asian region. Bikker and Spierdijk (2008) reported H-statistic value of 0.54 for Indian banking market and Claessens and Laeven (2004) reported H-statistic value of 0.47. The concentrated estimates from different estimation techniques show that H-statistic is accurate and robust, as misspecification of the PR model can lead to distorted results (Bikker, Spierdijk & Finnie, 2006a).

5. Concluding Remarks, Policy Implications and Future Research

The study estimated the banking competition in commercial banking sector of Pakistan by employing a measure derived from PR model. The results of this study are similar to the earlier literature on banking competition. Our findings confirm monopolistic competition in commercial banking sector of Pakistan as reported by Claessens and Laeven, (2004) and Bikker and Spierdijk (2008). The evidence depicts that degree of banking competition in Pakistan post financial crisis 2007 has not changed significantly despite variety of structural changes in banking sector. The findings also confirm the role of size in determining degree of banking competition in Pakistan. The findings show that the small banks are more competitive than large banks. One possible explanation for the findings could be that large bank size leads a superior reputation which consequently results in higher market power and profit margins. The greater market concentration and economies of scale empowers large banks to offer more diverse products than smaller banks and that leads to higher market power and probable collusionary activities between large banks. Further, big-

ger bank means bigger revenue and more money to cover investments and overhead, therefore lowering the costs per individual transaction and ultimately lowering the charges for customers. As industry regulators make requirements stricter, compliance costs are increasing, making scale even more important. Furthermore, the findings also support that the speed of adjustment (λ coefficient) with respect to factor input prices in small banks is better than larger banks. This also illustrates the higher level of banking competition in small banks as compared to large banks. The high degree of banking competition in small banks is explained by the fact that small banks focus more on domestic retail banking. Contrary the large banks extensively rely on wholesale banking. The findings of the study are robust and consistent with the earlier literature on banking competition.

The study provides foundation for future research on the factors deriving banking competition in Pakistan. Further, we leave it for future research to determine the impact of regulatory restrictions, macro-economic stability and institutional quality on banking competition in this part of the world. Based on our findings we recommend that State Bank of Pakistan should (1) monitor the profit deviation activities of commercial banks to ensure the stability of financial and banking sector (2) focus on effective formulation and implementation of monetary policy to restore optimal level of competition and stability in commercial banking sector of Pakistan (3) ensure that measures to enhance banking competition are effectively implemented as the banking competition has important role in effective transmission of monetary policy (4) focus, regardless of the bank sizes, on optimization to remain competitive in increasingly challenging environment (5) considering the colossal costs of financial crisis for the economy, it is imperative policy formulators establish framework to deter financial crisis (6) in a banking market like Pakistan where few large banks are too big to fail and their small counterparts are less likely to participate in high risk activities as they are more concerned about their existence, policy formulators should focus on implementing policies that seek to ensure optimal banking model with right mix of concentration and stability.

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.
- Amel, D. F., & Liang, J. N. (1990). Dynamics of market concentration in US banking, 1966-1986. *International Journal of Industrial Organization*, 8(3), 375-384
- Angelini, P., & Cetorelli, N. (2000). *Bank competition and regulatory reform: The case of the Italian banking industry* (Working Paper No. 380). Milan: Banca Italia.

- Anginer, D., Demircuc-Kunt, A., Zhu, M. (2012). *How does bank competition affect systemic stability?* Policy Research Working Paper No. 5981. Washington: World Bank.
- Baumol, W.J., Panzar, J.C., & Willig, R. D. (1983). Contestable markets: An uprising in the theory of industry structure: Reply. *The American Economic Review*, 73(3), 491-496.
- Berger, A. N., & Hannan, T. H. (1989). The price-concentration relationship in banking. *Review of Economics and Statistics*, 71(2), 291-299.
- Berger, A. N., & Hannan, T. H. (1998). The efficiency cost of market power in the banking industry: A test of the “quiet life” and related hypotheses. *Review of Economics and Statistics*, 80(3), 454-465.
- Besanko, D., & Thakor, A. V. (1992). Banking deregulation: Allocational consequences of relaxing entry barriers. *Journal of Banking and Finance*, 16(5), 909-932.
- Bikker, J. A., & Groeneveld, J. M. (1998). *Competition and concentration in the EU banking industry* (pp. 1-31). De Nederlandsche Bank NV.
- Bikker, J. A., Shaffer, S., & Spierdijk, L. (2012). Assessing competition with the Panzar-Rosse model: The role of scale, costs, and equilibrium. *Review of Economics and Statistics*, 94(4), 1025-1044.
- Bikker, J. A., Spierdijk, L., & Finnie, P. (2006a). *Misspecification of the Panzar-Rosse Model: Assessing competition in the banking industry* (De Nederlandsche Bank Working Paper No. 114). Amsterdam: De Nederlandsche Bank.
- Bikker, J. A., Spierdijk, L., & Finnie, P. (2006b). *The impact of bank size on market power* (Working Paper No. 120). Amsterdam: Netherlands Central Bank.
- Bikker, J., & Haaf, K. (2002). Competition, concentration and their relationship: An empirical analysis of the banking industry. *Journal of Banking and Finance*, 35(11), 2191–2214.
- Bikker, J.A. & Spierdijk, L. (2008). *How Banking Competition Changed over Time*. (DNB Working Paper, 167). Amsterdam: De Nederlandsche Bank.
- Bresnahan, T. F. (1982). The oligopoly solution concept is identified. *Economics Letters*, 10(1-2), 87–92.
- Bresnahan, T. F. (1989). Empirical studies of industries with market power. *Handbook of Industrial Organization*, 2, 1011-1057.
- Carbó, S., Humphrey, D., Maudos, J., & Molyneux, P. (2009). Cross-country comparisons of competition and pricing power in European banking. *Journal of International Money and Finance*, 28(1), 115-134.
- Chortareas, G. E., Garza-García, J. G., & Girardone, C. (2011). Banking sector performance in Latin America: Market power versus efficiency. *Review of Development Economics*, 15(2), 307-325.
- Claessens, S., & Laeven, L. (2004). What drives bank competition? Some international evidence. *Journal of Money, Credit and Banking*, 36(2), 563-584.
- 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.
- De Guevara, J. F., & Maudos, J. (2004). Measuring welfare loss of market power: An application to European banks. *Applied Economics Letters*, 11(13), 833-836.
- De Nicoló, M. G., Jalal, A. M., & Boyd, J. H. (2006). *Bank risk-taking and competition revisited: New theory and new evidence* (No. 6-297). International Monetary Fund.
- Delis, M. D. (2012). Bank competition, financial reform, and institutions: The importance of being developed. *Journal of Development Economics*, 97(2), 450-465.
- Demsetz, H. (1974). Two Systems of Belief about Monopoly. In H. J. Goldschmidt, M. Mann and J. F. Weston (eds.), *Industrial concentration. The new learning*. (pp. 164–184). Boston, MA: Little Brown.
- Demsetz, R., Saldenberg, M., & Strahan, P. (1996). Banks with something to lose: The disciplinary role of franchise value. *Economic Policy Review*, 2(2), 1–14.
- Evanoff, D. D., & Fortier, D. L. (1988). Reevaluation of the structure-conduct-performance paradigm in banking. *Journal of Financial Services Research*, 1(3), 277-294.
- Evanoff, D. D., & Ors, E. (2002). *Local market consolidation and bank productive efficiency* (Working Paper No. 2002-25). Chicago: Federal Reserve Bank.
- Gilbert, R. Alton. (1984). Bank market structure and competition: A survey. *Journal of Money, Credit, and Banking*, 16 (4), 617-45.
- Goddard, J. A., Molyneux, P., & Wilson, J. O. (2001). *European banking: Efficiency, technology and growth*. London: Wiley.
- Goddard, J., & Wilson, J.O. (2009). Competition in banking: A disequilibrium approach. *Journal of Banking and Finance*, 33(12), 2282-2292.
- Guzman, M. (2000). Bank structure, capital accumulation and growth: A simple macroeconomic model. *Economic Theory*, 16(2), 421–455.
- Hamza, A, R. (2011). Validation Panzar-Rosse Model in determining the structural characteristics of Tunisian banking industry. *Journal of Economics and International Finance*, 3(5), 259-268.
- Hannan, T. H. (1991). Bank commercial loan markets and the role of market structure: Evidence from surveys of commercial lending. *Journal of Banking & Finance*, 15(1), 133-149.
- Hellmann, T. F., Murdock, K. C., & Stiglitz, J. E. (2000). Liberalization, moral hazard in banking, and prudential regulation: Are capital requirements enough?. *American Economic Review*, 90(1), 147-165.
- Kane, E. J. (2010). Redefining and containing systemic risk. *Atlantic Economic Journal*, 38(3), 251-264.
- Keeley, M. C. (1990). Deposit insurance, risk, and market power in banking. *The American Economic Review*, 80(5), 1183-1200.

- Khan, M. (2009). *Concentration and competition in banking sector of Pakistan: empirical evidence* (SBP Working Paper Series No. 28). Karachi: State Bank of Pakistan.
- King, R. G., & Levine, R. (1993). Finance and growth: Schumpeter might be right. *Quarterly Journal of Economics*, 108(3), 717-738.
- Laeven, L. (2006). *Banking sector performance in East Asian countries: The effects of competition, diversification, and ownership. A background paper for East Asian Finance: The road to robust markets.* (The World Bank and CEPR Working Paper). Washington: World Bank Group.
- Lau, L.J. (1982). On identifying the degree of competitiveness from industry price and output data. *Economics Letters*, 10 (1-2), 93-99.
- Marcus, A. J. (1984). Deregulation and bank financial policy. *Journal of Banking & Finance*, 8(4), 557-565.
- Martinez-Miera, D., & Repullo, R. (2010). Does competition reduce the risk of bank failure?. *The Review of Financial Studies*, 23(10), 3638-3664.
- Maudos, J., & de Guevara, J. F. (2007). The cost of market power in banking: Social welfare loss vs. cost inefficiency. *Journal of Banking & Finance*, 31(7), 2103-2125.
- Molyneux, P, Thornton, J, & Lloyd-Williams, D.M. (1996). Competition and market contestability in Japanese commercial banking system. *Journal of Economics and Business*, 48(1), 33-45.
- Molyneux, P., Lloyd-Williams, D.M. & Thornton, J. (1994). Competitive conditions in European banking. *Journal of Banking and Finance*, 18(3), 445-459.
- Nathan, A., & Neave, H. E. (1989). Competition and contestability in Canada's financial system: Empirical results. *Canadian Journal of Economics*, 22(3), 576-594.
- Nerlove, M. (1956). Estimates of the elasticities of supply of selected agricultural commodities. *Journal of Farm Economics*, 38(2), 496-509.
- Northcott, C. A. (2004). *Competition in banking: A review of the literature* (Bank of Canada Working Paper 2004-24). Canada: Bank of Canada.
- Padoa-Schioppa, T. (2001). Bank Competition: A changing paradigm. *European Finance Review*, 5(1-2), 13-20.
- Panzar, C., & Rosse, N, J. (1987). Testing for 'monopoly' equilibrium. *The Journal of Industrial Economics*, 35(4), 443-456.
- Rafay, A. & Gilani, U.J. (2016). Banking competition and stability: Evidence from inter-continental markets. *DLSU Business and Economics Review*, 25(2), 24-40.
- Rosenblum, H. (2011). Choosing the road to prosperity: Why we must end too big to fail now. *Federal Reserve Bank of Dallas 2011 Annual Report*, 2-23.
- Rosse, N, J., & John C. Panzar. (1977). *Chamberlin vs. Robinson: An empirical test for monopoly rents.* New

Jersey: Bell Telephone Laboratories.

- Schure, P., & Wagenvoort, R. (1999). *Economies of scale and efficiency in European banking: New evidence* (Economic and Financial Report 1999/01). Luxembourg. European Investment Bank.
- Shaffer, S. (1989). Competition in the US banking industry. *Economics letters*, 29(4), 321-323.
- Shaffer, S. (1993). A test of competition in Canadian banking. *Journal of Money, Credit and Banking*, 25(1), 49-61.
- Smirlock, M. (1985). Evidence on the (non) relationship between Concentration and Profitability in banking. *Journal of Money, Credit and Banking*, 17(1), 69-83.
- Staikouras, C. K., & Koutsomanoli-Fillipaki, A. (2006). Competition and concentration in the new European banking landscape. *European Financial Management*, 12(3), 443-482.
- Weill, L. (2004). On the relationship between competition and efficiency in the EU banking sectors. *Kredit und Kapital*, 37(3), 329-352.
- Yeyati, E. L., & Micco, A. (2007). Concentration and foreign penetration in Latin American banking sectors: Impact on competition and risk. *Journal of Banking & Finance*, 31(6), 1633-1647.

Appendix

Table A1: PR-Model – Summary of Literature

Author(s)	Year of study publication	Country/Region	Conclusion
Shaffer	1989	US	Monopolistic competition (Rejecting collusion but also no perfect competition)
Nathan and Neave	1989	Canada	Monopolistic competition (Joint Monopoly)
Molyneux et al.	1994	UK, Germany, France, Italy and Spain	Monopoly in Italy and monopolistic competition for all other countries in sample
Molyneux et al.	1996	Japan	Monopoly in year of 1986 and monopolistic competition in 1988
Bikker and Haaf	2002	Twenty Three Industrialized Economies	Monopolistic competition observed (Joint Monopoly)
Claessens and Laeven	2004	Fifty countries	Competition less amplified in developed economies, Monopolistic competition
Al-Muharrami et al.	2006	Six Arab countries	Monopolistic competition (Joint Monopoly)
Laeven	2006	Five east Asian countries	Monopolistic competition (Joint Monopoly)
Yeyati & Micco	2007	Thirteen Latin American countries	Monopolistic competition (Joint Monopoly)
Hamza	2011	Tunisia	Monopolistic competition (Joint Monopoly)
Bikker et al.	2012	Sixty Three countries	Monopolistic competition (Joint Monopoly)
Rafay and Gilani	2016	US, EU and ANZ	Monopolistic competition (Joint Monopoly)

Table A2: Comparative Results of H-statistic three Estimation Methods

Estimation Method	Scaled revenue equation			Un-scaled revenue equation		
	H-statistic	S.E	R2	H-statistic	S.E	R2
OLS	-	-	-	0.68*	0.05	.87
GLS (Fixed effects)	0.52*	0.04	.69	0.59 *	0.04	.73
GMM	0.56*	0.03	.80	0.55*	0.26	.66

Notes: This table reports estimated values of H, corresponding standard errors S.E. and R2 obtained by OLS, GLS (Fixed effects) and (Arellano bond dynamic panel) GMM estimation for scaled and un-scaled revenue equation for commercial banks.

*Refers to hypothesis testing at a (5% significance level) indicates the acceptance of $0 < H < 1$ (monopolistic competition).