Market Structure and Performance of Bangladesh Banking Industry: A Panel Data Analysis

MD MOSTAK AHAMED[*]

The study examines the degree of concentration and performance of the Bangladesh banking industry for the period 1999-2011 by using the random effects (RE) estimator. It applies two competing hypotheses of the traditional industrial organisation theory e.g. the structure conduct performance (SCP) paradigm and efficient structure hypothesis (ESH) to investigate the relationship between the concentration and competition in the banking sector. The results of the main sample (1999-2011) do not find any support for either of the hypotheses. However, a sub-sample (2002-2011) of the study supports the SCP hypothesis that the profitability of Bangladesh banking market is determined by concentration and not by the market share of banks. It implies that concentration lowers the cost of collusion between banks and results in higher than normal profits for all market participants. Bank performance is positively associated with capitalisation, liquidity and assets size of the banks. The ownership variable suggests that government-owned banks are less profitable than other commercial banks in the market.

Keywords: Market Structure, Bank Performance, Structure-Conduct-Performance (SCP)
JEL Classification: L1

I. INTRODUCTION

Bangladesh banking system has undergone unprecedented changes over the last twenty years. The country moved away from state control to a relatively market-based open economy by adopting a major stabilisation, liberalisation and deregulation programme under the influence of the World Bank and the IMF against the backdrop of serious macroeconomic imbalances in the early 1980s.

After the initiation of Financial Sector Reforms Programme (FSRP) in 1990, the sector was opened to greater competition by the entry of new private banks and more liberal entry of foreign banks in line with the recommendations of this programme. In addition, the rapid developments of information technology,

[*]PhD Candidate, The Centre for EMEA Banking, Finance and Economics, London Metropolitan Business School, London Metropolitan University, UK. Email: a.mostak@londonmet.ac.uk.

where increased adoption of the internet as a delivery channel contributes to a gradual reduction in overhead expenses (Marketing, IT and Staff) of the banks by providing a high level of quality services through ATM, POS (Point of Sale), Online, Internet, Tele-banking, SWIFT and Reuter. These have changed the market structure of Bangladesh banking industry significantly. As a result, in recent years, the state-owned public banks have lost market share to the private commercial banks.

These changes will have vast implications for concentration and competition in the banking and financial sectors. However, increased concentration can intensify the market power of the large banks by fostering collusive behaviour among them and therefore hinder both competition and efficiency. In order to judge the implications of these structural changes and developments, it is imperative to examine current market structure of the banking sector to understand the impact the changes are likely to have on the market structure and the behaviour of banks.

Therefore, the objective of this study is to identify the impact of the structural changes likely to have on concentration (market structure) and performance of commercial banks in Bangladesh for the period 1999-2011. Moreover, the motivation to do this research mostly came from the rapidly growing literature on market structure issues in developed countries where very little attention has been paid so far to the developing countries. There is no empirical work of a specialist nature to determine the market structure and performance of Bangladesh banking industry. It is hoped that this study will be useful not only for the policymakers within the central bank and the government but also for the existing players, the potential entrants and for other stakeholders of the banking industry. The findings of this empirical research will provide great impetus to the policy makers to implement additional measures in order to ensure financial stability and greater competition in the banking sector.

II. HYPOTHESES

According to the traditional industrial organisation theory, there are two competing approaches: the Structure Conduct Performance (SCP) hypothesis and the Efficient Structure hypothesis (ESH). These competing hypotheses are used to investigate the relationship between the concentration and competition in banking sector. The SCP states that the higher the concentration in a market, the lower the competition and the higher profits that the firms receive, whereas ESH takes the efficiency factor into account and states that the firms with superior efficiency improve their market shares and become more profitable (Abbasoglu, Ahmet and Gunes 2007). This study tests the competing hypotheses to indentify

the structure of banking industry and the nature of profitability. In line with this test, this study also finds out how much concentrated the banking industry is and provides knowledge regarding top three (CR3) and top five (CR5) major banks by employing k-bank concentration ratio (CR_k) as well as the Herfindahl–Hirschman Index (HHI) for the total assets, deposits and loans markets of Bangladesh (detailed explanation is provided in section IV).

The remainder of the paper is structured as follows. An overview of Bangladesh banking industry is presented in Section III. Section IV discusses the relevant literature. Section V describes the data and methodology employed. The subsequent section explains the econometric issues in modeling of regressions and empirical results. Section VII provides the limitations of this study and some policy recommendations.

III. BANGLADESH BANKING INDUSTRY

The financial system in Bangladesh is mainly composed of two types of institutions: banks and non-bank financial institutions (NBFIs). The banking sector is supervised and regulated by the Bangladesh Bank (henceforth as BB), the central Bank of Bangladesh. The banking sector alone accounts for a substantial share of financial sector assets, with 48 banks accounting for about 95 per cent of the sector's total assets as of the end of December 2011. Since 2002, the domination of the banking system by the state-owned commercial banks (SCBs) has been declining while private commercial banks (PCBs) and foreign commercial banks (FCBs) have been gaining market share in both deposits and bank loans and advances (Bhattacharya and Chowdhury 2003), reflecting an increased competition in the banking industry. The market share of the SCBs declined substantially to 28.75 per cent of the total industry assets in 2011 as against 54.4 per cent in 1990, while PCBs' share rose to 65.24 per cent in 2011 as against 22.6 per cent in 1990. Similarly, FCBs have also shown slight increase holding total industry assets over the last ten years. FCBs hold 6.0 per cent of the industry assets as of 2011.

To create an efficient environment in the banking sector, the respective authorities have undertaken substantial initiatives in the legal, institutional and policy reforms areas since the 1990s. The main measures adopted by the Financial Sector Reforms Programme (FSRP) were to improve loan classification and provisioning, capital adequacy positions, the legal system and the strengthening of central bank's supervision. Since 1994, to measure the performance of the banking sector, CAMEL (Capital Adequacy, Asset Quality, Management, Earnings and Liquidity) rating system has been introduced for scheduled banks. Presently Bangladesh bank has employed Early Warning

Systems (EWS) of supervision to address the difficulties faced by banks. Any bank facing difficulty in areas of operation in terms of CAMELS framework is brought under EWS category and monitored closely to help improve its performance (Mollik and Bepari 2009).

TABLE I
NPL RATIOS BY TYPE OF BANKS (%)

Bank Type	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SCBs	45.6	38.6	37.0	33.7	29.0	25.3	21.4	22.9	29.9	25.4	21.4	15.7
DFIs	65.0	62.6	61.8	56.1	47.4	42.9	34.9	33.7	28.6	25.5	25.9	24.2
PCBs	27.1	22.0	17.0	16.4	12.4	8.5	5.6	5.5	5.0	4.4	3.9	3.2
FCBs	3.8	3.4	3.3	2.6	2.7	1.5	1.3	0.8	1.4	1.9	2.3	3.2
Total	41.1	34.9	31.5	28.0	22.1	17.6	13.6	13.2	13.2	10.8	9.2	7.3

Source: Annual Reports of Bangladesh Bank (Data is unavailable for the year 2011).
       SCBs: State-owned commercial banks, DFIs: state-owned development financial institutions, PCBs: private commercial banks, and FCBs: foreign commercial banks.

Consequently, the banking sector has witnessed a positive development in most of the key indicators of the industry. The sector was heavily burdened with high levels of nonperforming loans (NPLs). It was accumulated over many years due to weak management of the SCBs. However, Table I shows that the ratio of NPLs of various types of banks has decreased considerably over the last ten years. It has declined to 7.3 per cent at the end of 2010 from 41.1 per cent at the end of 1999. In addition, the introduction of bank capital regulations has solved the problem of undercapitalisation of banks by raising capital adequacy threshold from 9 per cent to 10 per cent of risk-weighted assets, and the core capital requirement from 4.5 per cent to 5.0 per cent (to be attained by December 2007). As a result, the structure of the banking system has changed substantially over the last decade, which can be realised from the concentration ratios of Bangladesh banking industry.

To examine the trends of market concentration in the Bangladesh banking industry, the market concentration index has been estimated based on CR_k and HHI over the period 1999-2011. Table II shows the CR3, CR5 and HHI of total assets, total deposits and total loans as the indicators of market concentration of commercial banks in Bangladesh. The results show that the estimated HHI of Bangladesh banking industry is between 1440 and 422 (total loans) for the period 1999-2011, which is considered as a moderately concentrated market. In addition, HHI, based on total assets and total deposits, also reveals a similar trend to that of HHI based on total loans. The market concentration ratio in the Bangladesh banking industry shows a decreasing trend between 1999 and 2011,

due to the continuous reform and restructuring since the 1990s. Both CR3 and CR5 for the total assets of the commercial banks of Bangladesh have significantly decreased to 0.26 and 0.36 at the end of 2011 from 0.59 and 0.69 in 1999 respectively.

TABLE II
TRENDS IN CONCENTRATION OF BANGLADESH
BANKING INDUSTRY: 1999-2011

Year	Total Assets			Total Deposits			Total Loans		
	CR3	CR5	HHI	CR3	CR5	HHI	CR3	CR5	HHI
1999	0.59	0.69	1412	0.59	0.69	1389	0.60	0.70	1440
2000	0.56	0.66	1298	0.56	0.67	1316	0.57	0.67	1295
2001	0.53	0.64	1165	0.54	0.65	1190	0.52	0.64	1129
2002	0.48	0.59	984	0.49	0.60	1009	0.47	0.59	946
2003	0.44	0.56	867	0.45	0.57	901	0.43	0.56	833
2004	0.41	0.53	788	0.42	0.54	799	0.38	0.50	715
2005	0.39	0.51	750	0.40	0.52	759	0.39	0.51	755
2006	0.35	0.47	653	0.36	0.47	663	0.35	0.47	662
2007	0.36	0.47	674	0.33	0.45	614	0.29	0.42	537
2008	0.32	0.43	605	0.30	0.42	562	0.26	0.38	501
2009	0.29	0.39	535	0.28	0.39	527	0.23	0.35	456
2010	0.28	0.39	514	0.28	0.39	514	0.22	0.34	435
2011	0.26	0.36	470	0.26	0.37	474	0.20	0.32	422

Source: Author's own calculation.
Note: The Herfindahl–Hirschman Index (HHI) is multiplied by 10,000.

There is a similar result for the concentration ratios of total deposits and total loans for the top three banks; the ratios have declined to 0.26 and 0.32 at the end of 2011 from 0.59 and 0.60 in 1999. On the basis of commercial banks market concentration index over the last ten years, it appears that Bangladesh banking industry is heading towards good competition. The main reason of the declining market concentration index over the period is the de novo entry of banks in the market. It seems to indicate that Bangladesh banking industry has transformed from a highly concentrated industry to a moderately concentrated market, reflecting the change in the market structure.

It is noted that a well-developed financial system is the backbone of an economy, particularly for developing market economy. The developmental evidence shows that good progress has been made in deregulating interest rates, strengthening prudential regulations, enhancing the capacity of the central bank and allowing more competition through a greater entry of private banking enterprises into the banking sector. Therefore, it is imperative to examine the structure of the banking sector and understand the nature of bank performance whether it is driven by concentration or market shares of banks.

IV. LITERATURE REVIEW

The literature on the measurement of bank competition has evolved mainly in two directions: the structural and non-structural approaches. This study focuses on the structural approach. According to the development of structural approach, it can be divided into two school of thoughts based on the traditional industrial organisation theory of firms. The first school of thought emphasised on the structure-conduct-performance (SCP) paradigm. SCP hypothesis assumes a causal relationship running from the structure of the market to the price setting behaviour of firms and ultimately to profitability through the market power channel (Prasad and Ghosh 2005). It attempts to infer the degree of competition in an industry from its structural features (Bain 1951). Basically, the SCP implies that concentration in the banking industry can generate market power allowing banks to earn monopolistic profits by offering lower deposit rates and charging higher loan rates. This reflects the setting of prices less favourable to consumers in more concentrated markets as a result of collusion or other forms of non-competitive behaviour. The more concentrated the market, the less the degree of competition. The smaller the number of firms and the more concentrated the market structure, the greater is the probability that firms in the market will achieve a joint price-output configuration that approaches the monopolistic solution (Staikouras and Koutsomanoli-Fillipaki 2006, Berger and Hannan 1989). In other words, SCP hypothesis is based on the assumption that concentration weakens competition by fostering collusive behaviour among firms. Collusive behaviour increases as market share is concentrated in the hands of a few firms. It suggests that higher concentration leads to higher prices, which in turn lead to greater than normal profits (Bain 1951). Therefore, concentration is inversely related to consumer welfare and the number of firms in the market. In addition, the price of the firm gets closer to marginal cost if concentration falls which leads to fall in market power as well. The earlier studies that supported the SCP hypothesis are Heggestad and Mingo (1977), Spellman (1981), Rhoades (1982) and Lloyd-Williams *et al.* (1994). The most recent studies on emerging banking markets that have found support for the SCP hypothesis are Katib (2004) on Malaysia, Al-Muharrami and Mathews (2009) on Arab Gulf Cooperation Council (GCC), Bhatti and Hussain (2010) on Pakistan and Sharma and Bal (2010) on India.

On the other hand, the second school of thought contradicts the traditional SCP hypothesis and proposes a competing explanation of the relation between market structure and performance. This hypothesis is called efficient structure hypothesis (ESH) suggested by Demsetz (1973) and Peltzman (1977). Several

studies provide support to this hypothesis including Smirlock (1985), Evanoff and Fortier (1988) and Samad (2008). Samad (2008) tests the validity of these two hypotheses (SCP and ESH) for the Bangladesh banking industry by using pooled and annual data for the period 1999–2002; he finds support for ESH as an explanation for market performance in Bangladesh. The most recent studies on emerging banking markets that have found support for the efficient structure hypothesis are Seelanatha (2010) on Sri Lanka and Chortareas *et al.* (2011) on Latin America.

These studies challenge the line of reasoning of the traditional SCP hypothesis and postulate that efficient banks are able to increase their market share due to their higher profitability. Consequently, the degree of concentration increases "automatically." Smirlock (1985) and Evanoff and Fortier (1988) argue that higher profits in concentrated markets could be the result of greater productive efficiency of firms with larger market share. Basically, the superior performance of the market leaders (due to firm specific factors such as technological or managerial skills) endogenously determines the market structure, implying that higher efficiency produces both higher concentration and greater profitability. They have also attempted to demonstrate that there is a relationship exists between bank market share and bank profitability but not between concentration and profitability. Staikouras and Koutsomanoli-Fillipaki (2006) illustrated that a bank with a higher degree of efficiency than its competitors (that is, if the bank has a relatively low cost of production structure) can adopt two different strategies. The first option is to maximise profits by maintaining the present levels of prices and company size. The second alternative is to maximise profits by reducing prices and expanding the size of the company. If the bank chooses the second option, the most efficient banks will gain market share and bank efficiency will be the driving force behind the process of market concentration without necessarily reducing the competitiveness. Market structure is therefore shaped endogenously by banks' performance, so that concentration is a result of economies of scale and the superior efficiency of the leading banks (Vesala 1995) and such banks earn Ricardian rent (Smirlock 1985).

V. DATA AND METHODOLOGY

This study includes cross-sectional data for 35 commercial banks operating in Bangladesh for the period 1999–2011. The data was obtained from Bureau van Dijk (Orbis) database and from the unconsolidated balance-sheets and income-statements published in the annual reports of the individual banks and their websites. The financial statements of foreign commercial banks had to be

collected from the Bangladesh Bank library archive. Although there are 48 banks in Bangladesh, this study includes 35 of them and dropped the rest because of lack of data availability. Descriptive statistics are reported in the Annex. As the availability of data for the years 1999, 2000 and 2001 was limited, this study had to work with an unbalanced panel data set for the period 1999-2011. The methodological issues related to structural model are discussed bellow.

5.1 Concentration Index

Molyneux *et al.* (1996) report that 37 out of 73 US SCP studies of the banking sector, from 1961 to 1991, have used the 3-bank deposit concentration measure, whereas 18 studies employed the Herfindahl–Hirschman Index (HHI). This study calculates both k-bank concentration ratio (CR_k) and the Herfindahl-Hirschman Index (HHI) to show the extent of market control of the largest firms in the Bangladesh banking industry and to illustrate the degree to which the industry is oligopolistic (Table II).

5.1.1 The k bank concentration ratio

Both simplicity and limited data requirements make the k bank concentration ratio one of the most frequently used measures of concentration in the empirical literature. Summing only over the market shares of the k largest banks in the market, it takes the form:

$$CR_k = \sum_{i=1}^{k} S_i \tag{1}$$

where, S_i is the market share of i-th bank when banks are ranked in descending order of the market share. In this study, the market share is measured on the basis of the asset size, loan size and the deposit size of the banks. The value of k is 3 and 5 i.e. CR3 and CR5.

However, the index gives equal emphasis to the k leading banks, but neglects the many small banks in the market. There is no rule for the determination of the value of k, so the number of banks included in the concentration index is a somewhat arbitrary decision. The concentration ratio may be considered as one point on the concentration curve, and it is a one-dimensional measure ranging between zero and unity. The index approaches zero for an infinite number of equally sized banks (given that the k chosen for the calculation of the concentration ratio is comparatively small when compared to the total number of banks) and it equals unity if the banks included in the calculation of the

concentration ratio make up the entire industry (Bikker and Haaf 2000, Al-Muharrami, Matthews and Khabari 2006). Therefore, HHI is calculated to eliminate any problems associated with concentration index.

5.1.2 The Herfindahl-Hirschman Index (HHI)

The Herfindahl-Hirschman Index (HHI) is the most widely treated summary measure of concentration, which often serves as a benchmark for the evaluation of other concentration indices. In the United States, the HHI plays a significant role in the enforcement process of antitrust[1] laws in banking and is extensively used by bank regulatory agencies; HHI is calculated by squaring the market share of each firm competing in a defined geographic banking market and then summing the squares. The HHI can range from zero in a market having an infinite number of firms to 10,000 in a market having just one firm (with a 100% market share). The HHI is a static measure and, therefore, gauges market concentration at a single point in time (Bikker and Haaf 2000, Al-Muharrami *et al.* 2006).

$$HHI = \sum_{i=1}^{n} S_i^2 \tag{2}$$

where n is the total number of banks in the industry. In the calculation of HHI, the larger banks get a heavier weighting than their smaller counterparts, which reflects their relative importance in the market.

5.2 Competing Hypotheses

The traditional and efficient structure hypothesis can be tested by estimating the profit equation of Weiss (1974) and Smirlock (1985) as shown below:

$$\prod = \alpha_0 + \alpha_1 CR + \alpha_2 MS + \sum \alpha_i X_i \tag{3}$$

where, $\prod$ is a profit measure as bank's performance and CR denotes concentration ratio representing the measure of market concentration. MS is a measure of market share of the bank. CR and MS act as proxy for the market structure and X is a vector of control variables which are included to take account for bank-specific and market-specific characteristics. The traditional SCP hypothesis would apply to the data if $\alpha_1 > 0$ and $a_2 = 0$, which implies that the

---

[1]According to the antitrust laws in the United States, to get approval for merger application of two banks the post-merger market HHI cannot exceed 0.18 and the increase of the index from the pre-merger situation must be less than 0.02 (Cetorelli 1999).

market share does not affect a firm's profitability and that profitability is the result of a monopoly behaviour measured by concentration. On the other hand, the efficiency structure hypothesis holds if $\alpha_1 = 0$ and $\alpha_2 > 0$. This implies that firms with a large market share are more efficient than their rivals and thus earn higher profits. In addition, market concentration does not affect bank profitability.

However, in this study, the following equation has been estimated in testing the relevance of SCP and ESH for the Bangladesh banking industry, as suggested by Lloyd-Williams, Molyneux and Thornton (1994) and Samad (2008) in the Spanish and Bangladesh banking industry respectively.

$$ROA = \alpha_0 + \alpha_1 CR + \alpha_2 MS + \alpha_3 CAPASS + \alpha_4 LDEP + \alpha_5 LTA + \alpha_6 OWNER \tag{4}$$

where return on assets (ROA) (i.e. net income/total assets) is a dependent variable, and measures bank performance. As a bank is a multi product service industry, prices of certain individual products or services are not a good measure for bank performance. In a multi-product service industry such as banking, cross subsidisation among the products and services is more common than in other single product industries. Like Lloyd-Williams *et al.* (1994), this paper uses profit for measuring bank performance which overcomes the problem of cross-subsidisation as profitability is a consolidated figure and takes into account all products and services regarding profits and losses. There are six independent variables in this model. CR3 is the three bank concentration ratios. It is used to measure market structure. This study uses three measures of CR3, for assets, deposits and loans. The sign for α_1, coefficient of CR3, is expected to be positive and significant for the SCP hypothesis. MS_i is the market share of ith bank in assets or deposits or loans. In bank-specific market share, MS, is used to capture bank efficiency. The sign for α_2, coefficient of MS, is expected to be positive and significant for ESH. There are some control variables that are included to take account for other risk, cost, size and ownership characteristics. As ROA is not risk adjusted, this study includes two bank-specific risk variables: the capital to total assets ratio (CAPASS) and ratio of loans to deposits (LDEP). It is expected that CAPASS would be negatively related to ROA and LDEP would be positively related. The asset size of banks (LTA) is included to take account of differences brought about by size, such as scale economies. The LTA variable is expressed in logarithmic form. The last variable is the dummy variable, OWNER, which is included to account for specific characteristics of the Bangladeshi banking market. Where the ownership of ith bank is represented by the binary value (1 for publicly (government) owned banks and 0 for all other commercial banks).

VI. EMPIRICAL ANALYSIS

6.1 Econometric Issues

The nature of the study requires doing the regression on a panel data framework. As a result, due to different parameters across the individuals, the regression results can be subjected to heterogeneity bias (Asteriou and Hall 2007). Moreover, autocorrelation and heteroskedasticity problem on the residuals can provide incorrect standard errors. To remove those problems from the regression, this study had to adopt robust econometric techniques. As cross-sectional data deals with different firms at a given point of time, such firms may be of different sizes such as small, medium, and large, heteroskedasticity is likely to be common. In order to check for the heteroskedasticity and autocorrelation problems, this study runs equation (4) and it shows that there is evidence of positive autocorrelation[2] and heteroskedasticity.[3] As a result, in the presence of autocorrelation and heteroskedasticity, the OLS estimation of equation (4) would provide biased and incorrect standard errors. Therefore, all equations were run using cluster-robust estimate of the random effects to obtain heteroskedasticity and autocorrelation corrected robust standard errors.[4] Random effects (RE) methods were chosen over fixed effects (FE) methods through Hausman tests and the p-values are reported at the bottom of Table III.[5] As the main sample (1999-2011) consists of unbalanced panel, a sub-sample (2002-2011) is also estimated by using RE estimators.

6.2 Analysis of Empirical Results

The regression results are shown in Table III. In the table regression equations (1), (2) and (3) report the results for the unbalanced panel of the Bangladeshi banks between 1999 and 2011 for the assets, deposits and loans markets of the banking industry respectively. In addition, regression equations (4), (5) and (6) report the result for the balanced panel for the period 2002-2011 for the same three different categories of markets in Bangladesh. The diagnostic statistics are provided at the bottom of the table and indicate a strong goodness of fit of all models. The R^2 of all the regressions (1-6) for ROA is in the range

---

[2]Wooldridge test for autocorrelation on panel data: the null hypothesis of no first-order autocorrelation of F $(1, 34) = 6.52$ and prob>F $= 0.015$, implying that there is a positive autocorrelation (tested for the assets model of eq. 1).

[3]Wald test for the null of homoskedasticity for the assets model of eq. 1 of $\chi^2 (35) = 40696.06$ and prob>chi2 $= 0.00$, suggests that there is evidence of heteroskedasticity.

[4] For details, see Cameron and Trivedi (2009).

[5]The null hypothesis of Hausman test is that the difference in coefficients is not systematic, and rejecting the null, thus suggests that FE is better than RE estimator.

between 0.23 and 0.38 and, similarly, the F-statistics/Wald tests of these regressions are statistically significant at 99% level.[6] This suggests that the model has a satisfactory overall explanatory power.

TABLE III
COMPETING HYPOTHESES REGRESSION RESULTS

	Base Results						Robustness Tests		
	Unbalanced Panel (1999-2011)			Balanced Panel (2002-2011)			Balanced Panel (2002-2011)		
	ROA	ROA	ROA	ROA	ROA	ROA	ROA	ROA	ROA
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Assets	Deposits	Loans	Assets	Deposits	Loans	Assets	Deposits	Loans
CR3	0.041	0.038	0.038	0.073***	0.069***	0.064***	0.074**	0.070***	0.066***
	(0.028)	(0.025)	(0.024)	(0.024)	(0.022)	(0.020)	(0.030)	(0.026)	(0.023)
MS	-0.17**	-0.15**	-0.17**	-0.27***	-0.27***	-0.29***	-0.27**	-0.27***	-0.30***
	(0.084)	(0.078)	(0.082)	(0.058)	(0.055)	(0.058)	(0.11)	(0.098)	(0.10)
CAPASS	0.095***	0.094***	0.097***	0.13***	0.13***	0.13***	0.13***	0.13***	0.13***
	(0.034)	(0.033)	(0.033)	(0.044)	(0.042)	(0.041)	(0.045)	(0.044)	(0.044)
LDEP	0.00024	-0.00025	0.0030	0.000001	-0.0003	0.0062***	-0.0004	-0.0006	0.0061**
	(0.0039)	(0.0041)	(0.0039)	(0.0021)	(0.0021)	(0.0023)	(0.0027)	(0.0027)	(0.0028)
LTA	0.0083***	0.0081***	0.0087***	0.011***	0.012***	0.012***	0.011***	0.012***	0.012***
	(0.0024)	(0.0023)	(0.0026)	(0.0022)	(0.0021)	(0.0024)	(0.0028)	(0.0027)	(0.0030)
OWNER	-0.014**	-0.015***	-0.015***	-0.0099**	-0.010**	-0.012***	-0.010	-0.011	-0.012*
	(0.0054)	(0.0055)	(0.0050)	(0.0047)	(0.0044)	(0.0040)	(0.0075)	(0.0072)	(0.0064)
Constant	-0.092***	-0.088***	-0.096***	-0.14***	-0.14***	-0.14***	-0.14***	-0.14***	-0.15***
	(0.034)	(0.032)	(0.034)	(0.032)	(0.030)	(0.032)	(0.041)	(0.038)	(0.040)
N	430	430	430	348	348	348	348	348	348
R^2	0.23	0.23	0.23	0.37	0.38	0.38	0.37	0.38	0.38
P[HT]	0.63	0.54	0.50	0.63	0.80	0.70	-	-	-
Decision	RE	RE	RE	RE	RE	RE	OLS	OLS	OLS
F/Wald-Test	404.86	549.62	5.38.36	225.13	255.03	535.89	**7.70**	**7.51**	**7.88**
Prob>Chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: (1) All estimations were carried out using Stata 11.1. (2) All estimations were run using cluster-robust estimate of the random effects models (VCE). (3) Heteroskedasticity and autocorrelation corrected robust standard errors are reported in parenthesis. (4)***, ** and * indicate significant level of 1%, 5% and 10% respectively. (5) P [HT] denotes for p-value of Hausman test; the F-test and Wald-test represent for the pooled OLS and random effects methods respectively.

Regarding unbalanced sample, it does not support the traditional interpretation of the SCP paradigm.[7] In regressions (1), (2) and (3), the

---

[6]The probability value of F-statistic/Wald tests of P [0.00] <0.01 rejects the null hypothesis and it implies that all the regression models have got significant explanatory power.

[7]It is assumed that the results of the main sample did not find any support for either of the hypotheses perhaps due to the lack of data for the period 1999-2001 for foreign commercial banks. Moreover, the first half of the sample, major banks reported lackluster performances (loss/little profit).

concentration ratio variable (CR3) is positive but statistically insignificant at the conventional level. Market share variable (MS) yields negative coefficients where it is statistically significant at the 5% level. The findings of these three equations, therefore, support neither the traditional SCP paradigm nor the efficient structure hypothesis for Bangladesh. However, the results obtained from the equations (4), (5) and (6) of balanced sample (2002-2011) support the traditional interpretation of SCP hypothesis. The coefficients of CR3 are positive and significant at 1% level with banking profitability. Like the results of unbalanced sample, MS is also significant but negatively related to ROA, implying that, on average, smaller banks are more profitable than larger ones (Goddard *et al.* 2001). To check the robustness of these results, this study has re-estimated the balanced sample with Ordinary Least Squares (OLS) methods. These robustness tests of the equations (7), (8) and (9) are reported on the right hand side of Table III. To eliminate the problem of heteroskedasticity and autocorrelation, robust standard errors are also calculated. The robustness results are similar to the base results of balanced panel and supporting SCP hypothesis. Therefore, the results indicate that the profitability for the Bangladeshi banking sector is determined by the concentration, not by the market share of banks.

In almost all of the regressions 1–6, the signs for the coefficient of CAPASS, LDEP, LTA and OWNER are consistent with the expectation of model and are statistically significant. In all of these regressions, the capital to assets ratio (CAPASS) is positively related to the bank's profitability and significant at 1% level. It implies that well-capitalised banks are involved in riskier operations and portfolios and thus tend to hold more equity. But, according to Lloyd-Williams *et al.* (1994), this is somewhat surprising. They argue that lower capital ratios are associated traditionally with greater risk taking so the coefficient of this variable is expected to be negatively related with the profitability. However, the asset size (LTA) is positive and statistically significant, indicating that the size of banks persuades higher profits between banks. On the other hand, the coefficient of the loan to deposit ratio (LDEP) is only significant for equations (6) and (9). Moreover, the coefficients of OWNER are significant for the equations (1-6). As the public sector's government owned banks were running losses in the years 2006 and 2007, the coefficient of OWNER is negative and statistically significant. The negative coefficients in all the regressions for the ownership variable (OWNER) suggest that government owned banks are less profitable than other commercial banks. Nevertheless, the regression results suggest that bank performances (ROA) are significantly dependent upon CAPASS, LDEP, LTA and OWNER for the Bangladesh banking industry.

However, this study clearly contradicts the study of Samad (2008) for performance measures in Bangladesh banking markets where he tested the validity of these two hypotheses for the period 1999-2002 and concluded that the efficiency of the banks measured by MS was an important factor for bank performance, not the concentration. But the present study tests the competing hypotheses for the period 1999-2011 and employs more robust estimations which suggest that it is concentration that is the important factor for bank performance in the Bangladesh banking market. The plausible reason is that the three largest banks, which accounted for an average of 40% market shares over the sample period of all assets, deposits and loan markets, were not so profitable up until 2007; however, the performance of these banks improved significantly from 2008 onward. The data suggests that three major banks had lackluster performances (reported loss or little profit) in the first half of the sample, but they reported remarkable profit in the last half of the sample. By and large, the result of this study is consistent with most of the previous studies such as Lloyd-Williams *et al.* (1994), Katib (2004), Al-Muharrami and Mathews (2009) and Bhatti and Hussain (2010). As a result, for the perspective of Bangladesh banking market, the ROA is negatively related to MS and positively related to CR3, which implies that concentration has lowered the cost of collusion between banks and resulted in higher than normal profits for all market participants. Though major banks are enjoying the monopoly power till to date, their power will be short lived because of increasing competition in the market from private and foreign commercial banks.

VII. LIMITATIONS AND POLICY IMPLICATIONS

As competition is a dynamic process, the use of a dynamic profit equation in the context of panel data framework might have given different results. However, using dynamic estimator and its complicatedness are beyond the limit of this paper. It is assumed that the difference of the results of dynamic and static profit equation is small. Therefore, the results obtained in this study have significant importance to suggest some policy implications. As the k-bank concentration index (CR3 and CR5) and the Herfindahl-Hirschman Index (HHI) have shown that the concentration of Bangladesh banking industry has decreased over the last ten years and it is considered as a moderately concentrated market, the banking regulators should keep in mind that the further indulgence of consolidation process through mergers and acquisitions in the market would deteriorate the competitive process. It is suggested that Bangladesh banking authorities would

enforce competitive process and reduce market power through gradual structural reforms procedures; otherwise, it would be detrimental to the welfare of society.

The banking industry of Bangladesh has undergone unprecedented changes over the last decade. These changes have resulted in fierce competition and greater productive efficiency in the banking market. Consequently, the market structure has changed significantly. The aim of this study was to examine current market structure and performance of the Bangladesh banking industry for the period 1999-2011. In doing so, the structural theories of structure-conduct-performance hypothesis and efficient structure hypothesis were tested in the context of the assets, deposit and loans market in Bangladesh to analyse the changes in the level of concentration and competition in the industry. The hypotheses were estimated by using random effect methods in a panel data framework. The results of the balanced panel (2002-2011) have shown that profitability in the Bangladeshi banking market is determined by the concentration, not by the market share of banks. In all instances, the market share (MS) variable has shown negative effects with the profitability. As a result, for the Bangladesh banking market, profitability is negatively related to market share and positively related to concentration ratios, which implies that concentration has lowered the cost of collusion between banks and resulted in higher than normal profits for all market participants.

REFERENCES

Abbasoglu, Furkan, O., A. Ahmet Faruk and A. Gunes. 2007. "Concentration, Competition, Efficiency and Profitability of the Turkish Banking Sector in the Post-Crises Period." MPRA Paper No. 5494.

Al-Muharrami, S., K. Matthews and Y. Khabari. 2006. "Market structure and competitive conditions in the Arab GCC Banking System." *Journal of Banking and Finance*, 30(12): 3487-3501.

Al-Muharrami, S. and K. Matthews. 2009. "Market Power versus Efficient-Structure in Arab GCC Banking." *Applied Financial Economics*, 19(18): 1487-1496.

Asteriou, D. and S. G. Hall. 2007. *Applied Econometrics: A Modern Approach using Eviews and Microfit*. Revised Edition, publisher Palgrave Macmillan.

Bain, J. S. 1951. "Relation of Profit Rate to Industry Concentration." *Quarterly Journal of Economics*, 65: 293–324.

Bangladesh Bank Annual Reports. 2008. "*Banking Sector Performance, Regulation and Bank Supervision*", Chapter 5, Dhaka.

Bangladesh Bank Annual Reports. 2010. "*Banking Sector Performance, Regulation and Bank Supervision.*" Chapter 5, Dhaka.

Berger, Allen N. and Timothy H. Hannan. 1989. "The Price-Concentration Relationship in Banking." *The Review of Economics and Statistics*, 712: 291-99.

Bhattacharya, D. and T. A. Chowdhury. 2003. "Financial Sector Reforms in Bangladesh: The Next Round." Occasional Paper 22, Centre for Policy Dialogue, Dhaka.

Bhatti, G. A. and H. Hussain. 2010. "Evidence on Structure Conduct Performance Hypothesis in Pakistani Commercial Banks." *International Journal of Business and Management*, 5(9).

Bikker, J. A. and K. Haaf. 2000. "Measures of Competition and Concentration in the Banking Industry: a Review of the Literature." Research Series Supervision Discontinued 27, Netherlands Central Bank, Directorate Supervision.

Cameron, A. C. and P. K. Trivedi. 2009. "*Microeconometrics Using Stata.*" Stata Press books, StataCorp LP.

Cetorelli, N. 1999. "Competitive Analysis in Banking: Appraisal of the Methodologies." *Economic Perspectives*, Federal Reserve Bank of Chicago, issue Q I: 2-15.

Chortareas G. E., J.G. Garza-Garcia and C. Girardone. 2011. "Banking Sector Performance in Latin America: Market Power versus Efficiency." *Review of Development Economics*, Wiley Blackwell, 15(2): 307-325.

Demsetz, H. 1973. "Industry Structure, Market Rivalry, and Public Policy." *Journal of Law and Economics*, 16: 1–9.

Evanoff, D. D. and D. I. Fortier. 1988. "Reevaluation of the Structure–conduct Performance Paradigm in Banking." *Journal of Financial Services Research*, 1(3): 277-294.

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

Heggestad, A. A. and J. J. Mingo. 1977. "The Competitive Condition of US Banking Markets and the Impact of Structural Reform." *Journal of Finance*, 32: 649–661.

Katib, M. N. 2004. "Market Structure and Performance in the Malaysian Banking Industry: A Robust Estimation." *SSRN eLibrary*.

Lloyd-Williams, D. M., P. Molyneux and J. Thornton. 1994. "Market Structure and Performance in Spanish Banking." *Journal of Banking and Finance*, 18(3): 433-443.

Mollik, A. T. and M. K. Bepari. 2009. "Banking System in Bangladesh: Stable or Vulnerable? A Macro-prudential Assessment." *Journal of Business Administration*, 34(3 & 4). Available at SSRN: http://ssrn.com/abstract=1513822

Peltzman, S. 1977. "The Gains and Losses from Industrial Concentration." *Journal of Law and Economics*, 20(2): 229–263.

Prasad, A. and S. Ghosh. 2005, "Competition in Indian Banking." IMF Working Papers 05/141, International Monetary Fund.

Rhoades, S. 1982. "Welfare Loss, Redistribution Effects, and Restriction of Output due to Monopoly." *Journal of Monetary Economics*, 9(3): 375–387.

Samad, A. 2008. "Market Structure, Conduct and Performance: Evidence from the Bangladesh Banking Industry." *Journal of Asian Economics*, 19(2): 181-193.

Sharma, M. K. and H.P. Bal. 2010. "Bank Market Concentration: A Case Study of India." *International Review of Business Research Papers*, 6: 95-107.

Seelanatha, L. 2010. "Market Structure, Efficiency and Performance of Banking Industry in Sri Lanka." *Banks and Bank Systems*, 5(1).

Smirlock, M. 1985. "Evidence on the Non Relationship between Concentration and Profitability in Banking." *Journal of Money, Credit and Banking*, 17(1): 69-83.

Spellman, L. J. 1981. "Commercial Banks and Profits of Savings and Loan Markets." *Journal of Bank Research*, 12: 32–36.

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

Vesala, J. 1995. "Testing for Competition in Banking: Behavioral Evidence from Finland." *Bank of Finland Studies*, E1.

Weiss, L. W. 1974. "The Concentration–profits Relationship and Antitrust." In H. Goldschmith, H. M. Mann & J. F. Weston (eds.) *Industrial Concentration: The New Learning*. Boston: Little, Brown, and Company.

ANNEX

DESCRIPTIVE STATISTICS OF BANGLADESH
BANKING INDUSTRY (1999-2011)

	Mean	S. Dev.	Min	Max
ROA	1.2	1.9	-14.3	17.4
CR3 (Assets)	40.5	10.5	26.0	59.0
CR3 (Deposit)	40.5	11.0	26.0	59.0
CR3 (Loans)	37.8	13.0	20.0	60.0
MS (Assets)	3.0	4.0	00.0	28.5
MS (Deposits)	3.0	4.0	00.0	28.0
MS (Loans)	3.0	3.8	00.0	27.7
CAPASS	7.9	8.3	-12.9	95.2
LDEP	76.5	19.2	0.7	301.8
TA	65986.83	84014.56	210.00	600989.00
N	455			

Note: Ratios are in %. ROA = return on assets; CR3 = three-bank concentration ratio; MS = market share of ith bank; CAPASS = ratio of capital over assets; LDEP = ratio of loans over deposits and TA = total assets.