

Competition in the Jordanian's Banking Sector

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ABSTRACT

This study evaluates the competitiveness and contestability in the Jordanian's banking industry for the period 2001-2005. The study methodology involves the estimation of revenue function and consideration of the Panzar and Rosse (1987) "H statistic". Given various specifications of "H statistic" on a panel of the 16 Jordanian's banks for the period 2001-2005, the study results revealed that the Jordanian's banking market cannot be characterized by either perfect competition or monopoly over the study period. That is, the banks under study are found to earn their revenues as if operating under conditions of monopolistic competition in that period. This conclusion holds under a variety of specifications controlling for bank-size, risk and deposit composition characteristics, and a number of estimation techniques. An analysis of changes in competitive structure shows a lower degree of competition in the later years of the sample period. In addition, large banks are found to be operating in a relatively more competitive environment compared to small banks. These findings triggers the recommendation that further structural deregulations and liberalization to the banking system of Jordan are needed to reduce the market concentration and enhance the competitiveness of this market.

Keywords: Banking, Competition, Jordanian's Banking.

1. INTRODUCTION

The Jordanian banking industry has witnessed significant changes that were supposed to affect greatly on its structure over the past few years. For instance, various foreign banks have entered the local market and the local banks have widened their activities and expanded their branching network. Furthermore, operating banks have benefited from advances in banking technology and the growth of institutional investors especially those coming from Arab oil producing countries. In addition, the regulatory authorities have updated the regulations governing the operations of the financial institutions. These changes are expected to heighten the competition in the industry. Some banks have responded to these changes partly by increasing their focus on non-interest income while others focused on their competitive strengths by expanding their menu of services and improving the quality of these services including retail banking.

In the context of these changes and anticipated

developments, this paper assesses the extent to which the past changes have impacted on the degree of competition in the Jordanian's banking industry over the past few years. The rest of this paper is structured as follows: Section 2 describes the contestable market theory proposed by Baumol (1982), a theory on which this study is based; Section 3 exposes selected literature about the competitiveness and contestability; Section 4 details the methodology of this study; and finally, Sections 5 and 6 present the study results and conclusion.

2. THE CONTESTABLE MARKET THEORY

There are two "structural" approaches for assessing competition: the "Structure-Conduct-Performance Hypothesis" (SCP) and the "Efficient Structure Hypothesis" (ESH). The SCP hypothesis assesses the degree of competition in an industry from its structural features (Bain, 1951). The SCP proposes that concentration in banking industry generate market power, allowing banks to earn monopolistic profits by offering lower deposit rates and charging higher loan rates. ESH, on the other hand, suggests that the positive relationship profitability and market concentration is not a consequence of market power but of the greater efficiency of firms with larger market share (Demsetz,

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1973). Based on these arguments bank efficiency serves as the leading force in market concentration.

"Non-structural" models, in particular the "Contestable Market Theory" recognize that banks behave differently depending on the market structure in which they operate. The (CMT) developed by Baumol (1982) puts forward that a concentrated industry can behave competitively when there are no (or low) barriers for new entrants to enter the market. These features of contestable markets imply that a concentrated banking market can be competitive even if it is dominated by a few large banks. This theory assumes that firms can enter or leave any market without losing their capital and that potential competitors have the same cost function as incumbent firms. Therefore, policymakers should be relatively less concerned when the financial system is dominated by few financial intermediaries if the financial market is contestable. On this basis, liberalizing regulations that particularly allow entry and exit to the market will likely enhance the banking industry contestability and competitiveness.

Earlier research has employed Panzar and Rosse (1987) or the so-called "H statistic" to examine various industries competitiveness. This approach suggests that banks employ different pricing strategies in response to change in input costs depending on the market structure in which they operate. To measure the degree of competitiveness, "H statistic" is estimated as the sum of the elasticities of the reduced form revenues function with respect to input prices. Thus, H statistic measures the percentage change in a bank's equilibrium revenues caused by one percent change in input prices.

If the market is characterized as monopoly, H statistic value is less than or equal to zero. This is because a monopolist's revenue will respond in the opposite direction to a change in input prices (a one percent increase in input prices leads to a one percent increase in marginal costs), thus reducing equilibrium output and revenue. Panzar and Rosse (1987) further show that the H statistic is negative when the structure is a conjectural variations short-run oligopoly.

The H statistic is equal to unity when the market structure is perfectly competitive. In perfect competition, a proportional increase in factor prices induces an equal change in gross revenues; output does not change in volume while the output price rises to the same extent as the input price (i.e. demand is perfectly elastic). Shaffer (1982) shows that the H statistic is also unity for a natural

monopoly operating in a perfectly contestable market and also for a sales-maximizing firm that is subject to breakeven constraints.

In addition to the above two cases, Panzar and Rosse (1987) distinguish the monopolistic competition, in which although banks behave like monopolists, the existence of entry or exit to the market by other banks makes them always generate zero profits. Under monopolistic competition, revenues will increase less than proportionally to changes in factor prices, as the demand for banking products facing individual bank is inelastic (Tirole, 1987). In this case, the H statistic will lie between zero and unity because revenues will increase less than proportionally to changes in input prices.

Except for the monopoly, the CMT assumes that banking industry is featured by long-run equilibrium, and that banks are profit-maximizing firms and there are normally shaped revenue and cost functions. Furthermore, it assumes that banks are treated as single product firms. This is consistent with the intermediation approach in banking where banks are viewed as financial intermediaries. Under this approach, the value of loans and investments are used as output; labor and capital are inputs and hence operating costs plus interest costs are the relevant measure of cost (given the competition among banks for survival, the distinction between interest and non-interest income become less relevant).

Various specifications for "H statistic" in the banking literature were undertaken. Molyneux et al. (1994) and Bikker and Groeneveld (1998) use the ratio of interest revenue to total asset as endogenous variables on their studies conducted on European banks. Shaffer (1982), Nathan and Neave (1989) on Canada, and Vesala (1995) on Finnish banks, Coccoresse (1998), and De Bandt and Davis (2000), use the logarithms of interest revenues. The use of logarithm is more appropriate - as noted by Vesala (1995) as the ratio of interest revenues to assets provides the price equation and the log specification may reduce simultaneity bias.

An important benefit of Panzar and Rosse (1987) model is that it does not require output price and quantity data since reduced-form revenue equations can be estimated without estimating the structural equations. Furthermore, the need for correcting for the quality disappears since output prices are not involved. Another benefit of the model is that it can incorporate bank-specific factors in the production function by using firm-level data. It also allows to examine the differences

among banks arising from type (e.g. commercial vs. savings), size (large vs. small), ownership (domestic vs. foreign, or state vs. private) etc.

3. THE LITERATURE REVIEW

The Panzar and Rosse (1987) approach has been employed in numerous studies that have examined the competitive structure of the banking industry in various countries. Shaffer (1982) applied this methodology to a cross-section of banking firms in New York in 1979, and found that competitive conduct of banks cannot be characterized as monopolistic or perfectly competitive in the long run.

Similarly, Nathan and Neave (1989) also rejected the hypothesis of monopoly and perfect competition for Canadian banks, trust companies and mortgage companies over the period 1983-1984. Molyneux et al. (1994) used the same analysis in a sample of German, UK, French, Italian, and Spanish banks for each year of the period 1986 to 1989. On average, their results suggest monopolistic competition in Germany, France, Spain and the UK, and monopoly in Italy. Vesala (1995) applied a similar model to the Finnish banking industry and found monopolistic competition for 1985-1988 and 1991-1992, and perfect competition for 1989-1990.

Molyneux et al. (1996) examined the competitive conduct of Japanese commercial banks and found monopoly for 1986 and monopolistic competition for 1988. Coccorese (1998) and Hondroyiannis et al. (1999) found monopolistic competition for Italian and Greek banking sectors. De Bandt and Davis (2000) reported monopolistic competition for large banks and monopoly for small banks for Germany and France, and monopolistic competition for small and large banks in Italy over the period 1992-1996. Bikker and Groeneveld (2000) found monopolistic competition of varying degrees for European Union (EU) countries for the period of 1989 to 1996.

Bikker and Haaf (2002) examined competitive conduct of banks in 23 developed countries over the period 1988-1999. They reported that the banking markets of industrialized countries could be characterized by monopolistic competition.

The impact of national bank concentration, regulations and national institutions on the likelihood of a country systemic banking crisis is tested by Beck et al. (2006). Using data on 69 countries from 1980 to 1997, the authors find that crises are less likely in economies

with more concentrated banking systems even after controlling for differences in commercial bank regulatory policies, national institutions affecting competition, macroeconomic conditions, and shocks to the economy. Furthermore, the authors' analysis indicates that regulatory policies and institutions that thwart competition are associated with greater banking system fragility.

Yildirim and Philippatos (2007) examine the competitive conditions in the banking industries of eleven Latin American countries for the period 1993-2000. For these countries, the time interval under examination corresponds to an era characterized by substantial reforms to restructure their banking systems. The banks in the sample are found to be earning their revenues as if operating under monopolistic competition. The results indicate that, overall market concentration is not significantly related with competitive conduct. Further, they find that deregulation and opening up of the financial markets for foreign participation is an important catalyst to increase the competitiveness of banking markets.

Berger et al. (2007) examine the effects of the consolidation in US banking by introducing a new approach to measure market size structure that include operations both within and outside the local market. Their quantity analysis result do not suggest a significant net advantage or disadvantage for large banks in small business lending, or in lending to informationally opaque small businesses. They also find few significant differences in the opacity or other characteristics of small businesses that borrow from large versus small banks. The authors argue that the prior research that excluded market size structure may be misleading and offer some likely explanations of why our results differ.

The consequences of consolidation and internationalization process on competition and banking sector fragility for eight Latin American banking over 1993-2002 is explored by Yeyati and Micco (2007). The results indicate that increased concentration appears to have had no influence in either front. By contrast, they find that foreign penetration weakened banking competition and as a result, foreign penetration has induced lower levels of risk. In reference to these findings, the authors suggest that in the shaken emerging Latin American markets, national banks may be seen as imperfect substitutes of foreign branches or subsidiaries, because of differences in their menu of products and the perception of an implicit insurance provided by their parents.

The relationship between efficiency and competition is evaluated by Schaeck and Cihak (2008) who apply an “industrial organization two-sided approach” on a large data set for European and U.S. banks. First, they employ Granger causality tests to establish the link between competition and profit efficiency and find that competition increases bank efficiency. Second, building on these results, they examine the relation between intensity of competition and the incentive to innovate and relate this measure to bank soundness. The authors find evidence that competition robustly increases bank soundness via the efficiency channel.

Jonghe and Vennet (2008) investigate how stock market investors perceive the impact of market structure and efficiency on the long-run performance of European banks. To that end, a modified Tobin’s Q ratio is introduced to discriminate between the market structure and efficient-structure hypotheses in a coherent forward-looking framework, in which differences in banks’ horizontal and vertical differentiation strategies are controlled for. The results show that banks with better management or production technologies possess a long-run competitive advantage. In addition, bank market concentration does not affect all banks equally. The authors also find that despite the harmonization of regulation in the European Union, the country-specific macroeconomic variables have a significant impact on bank performance.

Finally, Coccorese (2009) analyzes the conduct of a group of Italian single-branch banks operating as monopolists in small local areas to assess pricing behavior in highly concentrated markets utilizing two “new empirical industrial organization” techniques for the years 1988–2005. The results of both techniques strongly reject the hypothesis of pure monopoly pricing. The author findings provide evidence that market power may be small even in markets with only one bank, confirming that in this sector concentration and competition can coexist. The author concludes that, in spite of their advantageous condition, monopolistic banks are able to exploit only partially their market power, whose estimated level is far from the typical monopoly conduct.

Based on this literature review that evaluates the competitiveness of banking sectors in various emerging and developed countries, we can notice that various aims are sought and inconclusive results have been arrived. For instance, some studies explored the change in levels of competition due to consolidations, globalization and

deregulations. Other studies examine the impact of market competition on the availability of credit to firms of various sizes. Other studies tests whether banks operating in more concentrated markets enjoy market power and thus earn monopolistic profits. Other studies evaluate the impact of concentration versus competition on fragility of banking sectors. Despite the diversity of goals sought, various studies have concluded that banks in various markets seem to operate in environment that can be characterized as “monopolistic competition”.

In this study, it might be interesting to evaluate the competition level in the Jordanian banking sector considering the various issues addressed in the prior literature. Our results is supposed to help the regulatory authorities and other interested stakeholders to take more informed decisions to enhance the role and strengthen soundness and safety of this sector.

4. METHODOLOGY

To assess the recent patterns of banking competition in Jordan and to evaluate how far the banking sector stands from the perfect competition, we implement tests of Panzar and Rosse (1987), based on reduced form revenue functions on the panel of data of all 16 Jordanian’s banks over 2001-2005.

We estimate the revenue equation in which revenue is explained by factor prices and other bank-specific variables that affect long-run bank revenues on a panel data set of banks for the years 2001 through 2005.

$$\log R_{it} = \sum_{j=1}^J \alpha_j \log w_{it}^j + \sum_{k=1}^K \beta_k \log S_{it}^k + \sum_{n=1}^N \gamma_n X_{it}^n + \sum_{t=1}^T \tau_t Y_{it}^T + \varepsilon_{it} \quad (1)$$

for $t = 1; \dots; T$, where T is the number of periods observed and $i = 1; \dots; I$, where I is the total number of banks. Subscripts i and t refer therefore to bank i at time t . R_{it} is interest revenues or total revenues. The first specification for R_{it} agrees with the financial intermediation approach. The second specification is consistent with recent studies on banking that report an increasing share of non-interest income in total revenues. $J = 3$ inputs so that w_{it} is a vector of factor prices (price of deposits, price of labor and price of capital).

Other control variables are included to account for bank-specific risk, size, and deposit structure, in line with more recent studies methodologies. Thus, S_{it} are scale variables measuring the capacity level at which the bank operates including financial capital and total assets. These

size measures are used as a proxy for economies or diseconomies of scale. X_{it} are bank-specific variables (loans and deposits as a proportion of assets) that may alter the cost and revenue schedule. In addition, the loan

to total assets is used to control for risk. To control for the yearly macro effects, year dummy variables (Y_{it}) were also added. Finally, ε_{it} includes a systematic (time-varying) and bank-specific components.

Table 1. Measurement and Descriptive Statistics of variables (in JDs, figures are rounded to nearest digit)

Variables	Definition	Mean	Max.	Min.	Std. Dev.
1. Dependent variables					
Interest Rev.	Interest rev./T. Assets	67,986,540	775,153,000	3,218,550	16,712,930
T. Revenues	T. revenues/ T. Assets	90,918,010	949,727,000	4,969,360	21,419,710
2. Independent Variables					
Price of deposits (PF)	Interest exp./dep. & other liabs.	0.0287	0.0917	0.0079	0.0153
Price of labor (PL)	Personnel exp./ T. assets	0.0058	0.0283	0.0000	0.0051
Price of capital (PK)	The non-interest expense/ fixed assets	0.1659	0.8117	0.0427	0.1269
3. Control Variables					
Financial capital (EQTY)		156,643,450	1,859,630,000	-36,681,830	355,531,860
Total assets (TA)		1,619,434,320	16,815,804,000	53,385,250	3,705,124,400
Loans/Total Assets		0.3991	0.6669	0.1916	0.1059
Deposits/Total Assets		0.6297	0.9109	0.0012	0.1991
Year (T)		3.0000	5.0000	1.0000	1.4231

Table 1 presents measurements and descriptive statistics the variables utilized in our estimations. The measurements of the variables are straightforward (see for example De Bandt and Davis, 2000 and Yildirim and Philippatos, 2004). It should be noted, however, that our measurement of price of labor agrees with the definition in line with Molyneux et al. (1994) as well as Bikker and Groeneveld (1998).

The scale variables are expected to have a positive effect on revenues. On the one hand, a higher share of deposits and loans are indicators of the share of retail activities where competition may be less pronounced. The sign of the coefficient on the other set of variables is ambiguous.

As addressed earlier in the literature, monopolistic

competition is generally considered as the most plausible structure for the banking industry since it recognizes that banks can differentiate themselves through specialization, service quality, and advertising although their business is fairly homogenous. Thus, we test “Monopolistic Competition” as:

$$0 < H = \sum_{j=1}^J a_j < 1, \quad (2)$$

5. EMPIRICAL RESULTS

Various specifications of equation (1) are employed to make sure that our estimations are not sensitive to specific model specifications. As our study is confined to one country, it is fair to assume that banks under study

have access to the same factor markets but differ in terms of scale of operations. Furthermore, in line with Bandt and Davis (2000), we assume that the time-series dimension is equally important. In addition running an

Ordinary Least Squares (OLS) regression on equation (1), year by year ($t = 1; \dots T$), may provide irregular results, and we therefore decide to concentrate on pooled sample regressions.

Table 2. H Statistics for Pooled Ordinary Least Square Estimation

	Model 1	Model 2
Dependent Variable	Ln (Interest Rev.)	Ln (T. Rev.)
C	-1.456**	-0.478
Ln (Price of deposit)	0.488**	0.515**
Ln (Price of labor)	-0.063**	-0.046
Ln (Price of capital)	-0.046	0.021
Ln (Financial Capital)	-0.014	0.001
Ln (Total Assets)	1.018**	0.977**
Ln (Loan/Assets)	0.435**	0.363**
Ln (Deposit/Assets)	0.025	0.034
Ln (Year)	0.040	0.209**
H-Statistic	0.379	0.490
H ₀ : H=0 (P-value of F test)	Reject H ₀ (0.000)	Reject H ₀ (0.000)
H ₀ : H=1 (P-value of F test)	Reject H ₀ (0.000)	Reject H ₀ (0.000)
Indications	MC	MC

*(**): Statistically Sig. at 5% (1%)
MC = Monopolist Competition

Table 3. Fixed Effects Models with and without Years' Dummies

	Model 3	Model 4	Model 5	Model 6
Dependent Variable	Ln (Interest Rev.)	Ln (T. Rev.)	Ln (Interest Rev.)	Ln (T. Rev.)
C	1.225	1.517	3.362**	6.077**
Ln (Price of deposit)	0.482**	0.492**	0.301**	0.150
Ln (Price of labor)	-0.030	-0.029	0.001	0.035
Ln (Price of capital)	-0.005	0.001	-0.041	-0.060
Ln (Financial Capital)	-0.012	0.007	-0.015*	0.000
Ln (Total Assets)	0.898**	0.876**	0.766**	0.611**
Ln (Loan/Assets)	0.362	0.438*	0.208	0.107
Ln (Deposit/Assets)	0.205*	0.062	0.176	-0.003
Ln (Year)	0.056	0.217**		
Year 1 Dummy			-0.057	-0.288*
Year 2 Dummy			-0.110**	-0.360**
Year 3 Dummy			-0.169**	-0.392**
Year 4 Dummy			-0.146**	-0.302**
H-Statistic	0.447	0.464	0.261	0.125
H ₀ : H=0 (P-value (F test))	Reject H ₀ (0.000)	Reject H ₀ (0.001)	Do not Reject H ₀ (0.055)	Do not Reject H ₀ (0.344)
H ₀ : H=1 (P-value (F test))	Reject H ₀ (0.000)	Reject H ₀ (0.000)	Reject H ₀ (0.000)	Reject H ₀ (0.000)
Indications	MC	MC	M	M

*(**): Statistically Sig. at 5% (1%)
MC = Monopolist Competition
M = Monopoly

On this basis, the regression models are first estimated by the OLS method on the pooled sample of banks and years, assuming that standard errors are independently distributed across banks and over time. Panel data allows controlling for heterogeneity bias, or the confounding

effects of omitted variables that are stable over time.

Table 2 summarizes the coefficients of our models specifications given the dependent variable in the first model is interest revenue while the total revenue is the dependent variable in the second model.

Table 4. Between Estimators Models

	Model 7 (Between Estimator)	Model 8 (Between Estimator)
Dependent Variable	Ln (Interest Rev.)	Ln (T. Rev.)
C	-0.179	0.567
Ln (Price of deposit)	0.398**	0.329**
Ln (Price of labor)	-0.045	-0.005
Ln (Price of capital)	-0.022	0.001
Ln (Financial Capital)	-0.019**	-0.004
Ln (Total Assets)	0.950**	0.917**
Ln (Loan/Assets)	0.302	0.203
Ln (Deposit/Assets)	0.061	0.023
Ln (Year)		
Year 1 Dummy	-0.051	-0.269**
Year 2 Dummy	-0.067	-0.283**
Year 3 Dummy	-0.080*	-0.258**
Year 4 Dummy	-0.089**	-0.197**
H-Statistic	0.331	0.325
H ₀ : H=0 (P-value (F test))	Reject H ₀ (0.012)	Reject H ₀ (0.000)
H ₀ : H=1 (P-value (F test))	Reject H ₀ (0.000)	Reject H ₀ (0.000)
Indications	MC	MC

*(**): Statistically Sig. at 5% (1%)
MC = Monopolist Competition

Table 5. Test for Structural Change in Competition over time

	Model 9 (OLS 2001-03)	Model 10 (OLS 2003-05)	Model 11 (OLS with year Dummy)
Dependent Variable	Ln (Interest Rev.)	Ln (Interest Rev.)	Ln (Interest Rev.)
C	-1.096*	-1.991**	-1.470**
Ln (Price of deposit)	0.629**	0.358**	0.487**
Ln (Price of labor)	0.005	-0.078	-0.065**
Ln (Price of capital)	0.021	-0.132	-0.046
Ln (Fin. Capital)	-0.015	-0.023	-0.014
Ln (Total Assets)	1.036**	1.024**	1.017**
Ln (Loan/Assets)	0.175	0.612**	0.440**
Ln (Deposit/Assets)	0.045	0.012	0.026
Ln (Year)	0.088	0.004	0.052
Dummy-Year			-0.019
H-Statistic	0.655	0.148	0.376
H ₀ : H=0 (P-value (F test))	Reject H ₀ (0.000)	Do not reject H ₀ (0.284)	Reject H ₀ (0.000)
H ₀ : H=1 (P-value (F test))	Reject H ₀ (0.003)	Reject H ₀ (0.000)	Reject H ₀ (0.000)
H ₀ = Dummy year =0			Reject H ₀ (0.779)
Indications	MC	M	MC

*(**): Statistically Sig. at 5% (1%)
MC = Monopolist Competition
M = Monopoly

In both cases in table 2, the H-statistic is positive and significantly different from zero and unity, suggesting that banks operating in a monopolistic competition environment. Models 1 and 2, in table 2, reject the hypothesis H=0 (indicating monopoly) and reject also the hypothesis that H=1 (indicating perfect competition).

According to the above findings, we reject the monopoly and perfect competition hypotheses for Jordanian's banking market and conclude that banks in these countries seem to earn their revenues as if under the conditions of monopolistic competition.

As the table 2 shows, the elasticity of revenues to the

cost of financial resources are mixed. The scale variables in most cases are consistently positive and significant, and the ratio of deposits to total assets is positive but insignificant while the loan to assets variable is positive and significant.

To account for heterogeneity, we also used the Generalized Least Squares (GLS) fixed-effects estimators to correct for the effect of any combination of time-invariant variables that have been omitted. This estimation entails specifying a different intercept term for each bank in the sample as well as time dummies for each year. Then it is important to test whether omitted bank-specific variables or time varying factors may affect inference. We therefore introduce different intercepts ($\alpha = \alpha^i, i=1, \dots, I$) as well as time dummies ($DU_t; t = 1; \dots, T - 1$) in equation (1). However, as factor costs may be time-dependent and generate multi-collinearity, we report results both with and without time dummies (see for details De Bandt and Davis, 2000).

According to the F-test, fixed effects (i.e. the introduction of different intercepts for each bank to account for heterogeneity) are also significant for models with years' dummies, pointing to a possible omitted variable describing the business mix. The value of H statistic for models 3 and 4 are quite close and similar to our OLS results (Table 2, based on model 1 and 2 addressed earlier) suggesting that banks operating in a monopolistic competition environment.

However, introducing years' dummies to the models lead to a significant decline in the value of H statistic (the hypotheses that banks are operating in a monopoly environment are not rejected in model 5 and 6). Furthermore, the coefficients of all the years' dummies are significant at 1 percent level. The most plausible explanation for the reduction in value of H statistic when including years' dummies, in the models, is that the share of the large banks (those whose share of total assets is above the median asset size of the banks under study) has grown significantly over time from 0.70 in 2001 to 0.87 in 2005¹. This lead to the conclusion that competition in the Jordanian's banking system has decreased significantly due to the increase in the share of large banks over the study period from 2001 to 2005.

1 Note, the share of the large banks in total assets of the banking sector has grown significantly over the study period (the share was 0.70, 0.76, 0.81, 0.87 and 0.89 in the years 2001 through 2005 respectively).

Finally, we estimate equation 1 by considering the "between" estimator which summarizes the cross sectional dimension (i.e. a time average for each bank over the sample period). Heteroscedasticity consistent standard errors of the fixed effect estimators were also computed using White's (1980) estimator.

Table 4 shows the results of "between" estimator, which measures the time average of the year-to-year estimator, appears to be not different from our findings in table 1 and 2 (model 1, 2, 3 and 4) that suggest banks operates in a monopolistic competition environment.

To summarize, most of our estimated models suggest that the Jordanian's banks are operating in a monopolistic competition. However, the estimated models with years' dummies do not reject the hypotheses that the Jordanian's banks operates in a monopoly environment.

Other Sensitivity Tests

To confirm our findings summarized above, various sensitivity tests were conducted. First, we analyzed the significance of changes in H-statistic over time by dividing our overall sample period into two sub-periods (models 9 and 10). Furthermore, the three input price variables were allowed to interact with a dummy variable that took the value of zero before the break point 2003 and a value of one in 2003 and afterwards, Model 11). Significant interaction terms would imply a structural break in the relationship between bank revenues and input price elasticities, and also provide information on the direction of the change. Table 5 lists the results of testing for structural change in competition over the two sub-periods.

The results reported in table 5 (model 9, 10 and 11) all confirms our findings earlier that the levels of H statistic to be significantly above zero but also well below one (model 9 and 11) implying forms of monopolistic competition rather than either monopoly or perfect competition. However model 10 confirms our explanation suggested earlier that the levels of contestability in the Jordanian's banks has decreased significantly over time due to the significant increase in the share of the large banks over time.

Furthermore, we run equation (1) by splitting our sample data based on the bank size into large and small banks (large and small banks are determined by total assets above and below the median asset size in the sample) by including a dummy variable that takes value of 1 for large banks and zero otherwise (table 6 below summarizes our results).

Table 6. Test for Structural Change in Competition (Model 12 with Size Dummy)

Dependent Variable	Ln (Interest Rev.)	Ln (interest Rev.)	Ln (interest Rev.)
		Large Banks	Small Banks
C	0.183	2.116*	-1.765*
Ln (Price of deposit)	0.561**	0.373**	0.511**
Ln (Price of labor)	-0.036	0.053	-0.086*
Ln (Price of capital)	-0.011	0.103	-0.098
Ln (Financial Capital)	-0.012	0.108	-0.018*
Ln (Total Assets)	0.949**	0.760**	1.030**
Ln (Loan/Assets)	0.389**	0.415*	0.483**
Ln (Deposit/Assets)	0.024	-0.645	0.036
Ln (Year)	0.100*	0.043	0.059
Dummy- Size	0.250**		
H-Statistic	0.514	0.529	0.326
H ₀ : H=0 (P-value (F test))	Reject H ₀ (0.000)	Reject H ₀ (0.000)	Reject H ₀ (0.006)
H ₀ : H=1 (P-value (F test))	Reject H ₀ (0.000)	Reject H ₀ (0.001)	Reject H ₀ (0.000)
Indications	MC	MC	MC
H ₀ = Dummy Size =0	Reject H ₀ (0.000)		
H ₀ : H _{Large} = H _{Small} : P-value (F-test)	Reject H ₀ (0.000)		
Large and small banks are determined by total assets above and below the median asset size in the sample.			
*(**): Statistically Sig. at 5% (1%)			
MC = Monopolist Competition			

Table 7. Equilibrium Tests

Dependent Variable	Model 13	Model 14
	ROA	Ln (ROA)
C	0.036	-3.178
Ln (Price of deposit)	0.003	-0.133
Ln (Price of labor)	-0.001	0.152
Ln (Price of capital)	-0.003	-0.245
Ln (Financial Capital)	0.003**	1.733**
Ln (Total Assets)	-0.004*	-1.573**
Ln (Loan/Assets)	0.017*	1.464*
Ln (Deposit/Assets)	-0.001	0.265
Ln (Year)	0.012**	0.528
H ₀ : H=0 (P-value (F test))	Do not reject H ₀ (0.898)	Do not reject H ₀ (0.708)
*(**): Statistically Sig. at 5% (1%)		

According to Table 6, the H-statistics for large banks are significantly higher than that of smaller banks. Therefore, we can say that large banks operate in a relatively more competitive environment; competition seems to be lower in local markets compared to national and international markets.

Our results suggest that the concentrated banking markets seem to lead to anti-competitive conduct as suggested by the traditional SCP hypothesis. These results seem to be not compatible with contestable markets theory (CMT) which assumes that incumbent banks set their prices close to the competitive level because of the potential competition.

Equilibrium Tests

To confirm that the Panzar-Rosse statistics provide useful results, we assess whether the banking system that we consider are in equilibrium. Previous studies tested the accuracy of this assumption by estimating the elasticity of bank returns to changes in input prices, based on the premise that bank returns should not be statistically correlated with input prices in equilibrium (Molyneux et al., 1994). For this test, we follow the literature by running the original regression model in Equation (1) with return on assets being the new dependent variable.

As suggested by Molyneux et al. (1994), a value of H

= 0 would indicate an equilibrium in the banking markets. If the results indicate a certain form of competitiveness, then the monopolistic behavior is not exercised. If the results do not indicate long-run equilibrium, $H \leq 0$ no longer proves monopoly, but $H > 0$ still rejects monopoly or conjectural variation short-run oligopoly (Shaffer, 1982, 1983, 1985). We perform the equilibrium tests for the pooled data over the sample period. The models were estimated using OLS and the Wald test is used to test the $H=0$ hypothesis.

Our results presented in table 7 reveal the existence of equilibrium of the data using the return on asset ratio (ROA) and the natural logarithm of ROA as dependent variable (model 13 and 14). This proves that the Panzar and Rosse (1987) methodology can be used constructively to estimate the degree of market contestability in Jordanian's banking and our results presented earlier represents the reality regarding the competitiveness of the Jordanian's banking industry.

6. CONCLUSION

This study examines the competitive conditions in Jordan's banking industry for the period 2000-2006. This period corresponds to a period characterized by important reforms undertaken by financial regulatory authorities to restructure the industry into market-based system and to liberalize the financial systems to integrate with the advanced financial systems

To evaluate the competitive conditions, we utilize the model suggested by Panzer and Rosse (1987). The results

of the competition analysis suggest that the Jordan's banking market cannot be described by either perfect competition or monopoly over 2001-2005. That is, banks earned their revenues as if operating under conditions of monopolistic competition in that period. An analysis of changes in competitive structure shows a lower degree of competition in the later years of the sample period. Our results also present evidence that the degree of competition among large banks is significantly higher than the degree among the smaller banks. Thus, our overall conclusion for the banking system under investigation is that the banking market structure can be characterized as monopolistic competition. This conclusion holds under a variety of specifications controlling for bank-size, risk and deposit composition characteristics, and a number of estimation techniques. Our findings about the competitiveness of the Jordanian banking sector are not very different from the findings of the most empirical studies findings that have been conducted on the banking sectors in various countries and found varying degrees of monopolistic competition.

The study results however support the view that high concentration in Jordan's banking market will result in monopoly as suggested by SCP hypothesis. These results are incompatible with contestable theory. These findings necessitate the need for further deregulations and liberalizations for the banking system to reduce the concentration in the market and to enhance the competitiveness in this sector.

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