The Market Structure-Profit Relationship in the Jordan’s Banking Industry

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ABSTRACT

This study examines the structure-profit relationship in the Jordan’s banking industry. The study sample consists of all the local banks operating in the market over the 2001-2005 period. The study hypotheses are divided into two parts. First, the hypotheses related to the market power structure which includes the traditional structure-conduct-performance hypothesis (MP) and the relative market power hypothesis (RMP). Second, the hypotheses related to the efficient structure (ES) which includes X-efficiency hypothesis (ESX) and scale efficiency hypothesis. Tests of the hypotheses are performed by regressing profits against measures of concentration, market share, X-efficiency, and scale efficiency.

The empirical results generally support the traditional SCP hypothesis; with limited support to the scale-efficiency version of the efficient structure (ESS) in the Jordanian’s banking industry over the study period. Thus, the main implication of these results for the policymakers, of Jordanian’s banking sector, is to expand the ongoing deregulation efforts with the aim of reducing the industry concentration and enhancing the market competitiveness.


1. INTRODUCTION

This study examines the structure-profit relationship in Jordan’s banking industry. The banking industry in Jordan has witnessed important changes over the past decade, represented by the rapid expansion of branch banking and the appearance of new financial intermediaries. These new developments suggest that structural changes should be guided in order to protect the viability of the banking system as a regulated industry. From a regulatory viewpoint, it is important to have information about the impact of market concentration and market share on competition and productive efficiency. Such information could be used to determine the type of banking structure, which will promote productive efficiency without adversely affecting competition.

In banking literature, there have been many studies on the structure-profit in banking. The common finding of these studies is that there is a positive relationship between profitability and measures of market structure. Various contrasting interpretations for these results are presented. The traditional structure-conduct-performance hypothesis (SCP) asserts that this finding reflects the setting of prices that are less favorable to consumers in more concentrated markets. The relative-market power hypothesis (RMP), on the other hand, asserts that only firms with large market shares are able to exercise market power and earn supernormal profits (Shepherd 1982).

In contrast to these theories, there are two efficiency explanations of the positive relationship between profits and either concentration or market share. Under the X-efficiency version of the efficient-structure hypothesis (ESX), firms with superior management or technologies have lower costs and therefore higher profits. Under the scale-efficiency version of the efficient-structure hypothesis (ESS), some firms produce at more efficient scales than others, and therefore have lower unit costs and higher unit profits. To the extent that these hypotheses are correct, mergers may be motivated by efficiency that would increase total surplus.

This paper distinguished among the four hypotheses by using direct measures of both market structure and efficiency. All the four hypotheses: SCP, RMP, ESX, and ESS, are represented by different variables. We regress bank profitability on variables measuring concentration

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(CONC), market share (MS), X-efficiency (X-EEF), and scale efficiency (S-EEE) on the Jordan’s banks data set over the 2001-2005 period.

2. THE STUDY PROBLEM AND OBJECTIVES

This study aims at evaluating the structure-profit relationship in the Jordanian’s banking industry, in the context of considerable structural changes that have recently occurred and expected to have impact on the levels of prices, profits and other aspects of the industry. These changes should be guided in order to protect the viability of the banking system as a regulated industry. Awareness of these changes helps also the regulatory authorities to direct their policies to restructure the industry in a way that enhances social benefits.

In particular, this study will address various aspects of the Jordanian’s banking industry over the 2001-2005 period. First, does the market structure matter in the Jordanian’s banking industry or is the industry so highly regulated that market structure is not a relevant factor in determining performance? Second, which aspects of the market structure are the most important and therefore which type of regulations or regulatory reforms has the greatest impact? which aspects of bank performance are the most sensitive to differences in market structure?

Answering the inquiries raised earlier helps the Jordanian’s regulatory authorities to determine the market structure that promotes banking sector efficiency without adversely affecting its competitiveness (see for instance Longbrake and Haslem (1975)). Furthermore, as suggested by Heggestad and Mngo (1979), knowledge of the structure-profit relationship is important for public policy in determining the costs of mergers and other market structural changes. Finally, evaluating the structure profit relationship as noticed by Berger and Humphrey (1997), guides the government policy by assessing the effects of deregulation, mergers and other structural changes on the industry firmness and stability.

3. THE SCP RELATIONSHIP AND SOME EMPIRICAL EVIDENCE

There have been many studies of the structure-conduct-performance relationship (SCP) in banking. The study of SCP, initiated by Mason (1939), has long dominated the public policy toward the effects of industry structure on firms’ behavior, profit levels, consumer welfare, and total welfare.

Through the link of conduct, the performance of firms in the market is tied to the structure of the market. Most markets do not fall neatly into either the perfect condition or the monopoly category. Heggestad (1979) sums up that under the conditions of perfect competition, the consumer's welfare is maximized, while the firm's welfare is maximized under conditions of monopoly.

However, the argument that firms have monopolistic advantages in concentrated markets is criticized by Demsetz (1973). He proposes that the cost advantages that give rise to increased competition may be reflected in scale economies or it may be reflected in better products which satisfy demand at lower cost.

Against the traditional explanation for the market structure, Edwards (1977) argues that the expense preference model indicates that the objective of the banking firm is expense-preference behavior and not necessarily profit maximization, which is the implicit assumption in the collusion framework. This theory envisages that the firm maximizes utility by indulging its preference for greater staff and higher salaries.

The other explanation for the SCP is the efficient structure approach. This approach is followed by Demsetz (1973) and others who hypothesize that market concentration is not a random event but rather the result of superior efficiency. Smirlock et al. (1984) examine the empirical relationship between firm rents and market structure to assess the validity of either the traditional structure-conduct-performance or the efficient structure interpretation. Their results indicate that the efficient structure hypothesis more accurately describes the relationship between market structure and firms’ behavior.

The profit-efficiency relationship in Irish credit institutions is investigated by Lucey (1995). He compares three main SCP hypotheses; the standard SCP approach, the relative efficiency hypothesis, the quiet life hypothesis, and the expense preference hypothesis. He finds evidence that the relative efficiency paradigm is an adequate explanation of returns on assets, but the evidence is mixed for the building society sector, where some evidence regarding the quiet life variant of the SCP paradigm is found.

As for more recent banking literature that addresses the impact of market structure on bank performance, Berger et al. (2005) examine the impact of market size structure on the competition in U.S. banking industry. They find that the likelihood that a small business obtains credit from a bank of a given size is roughly proportional to the local market presence of banks of that size. They
also find that the loan rate premiums on small business loans are significantly negatively affected by a greater market presence of large banks.

As for the studies conducted in emerging markets that are somehow similar to the banking sector of Jordan, Al-Muharrami et al. (2006) investigate the market structure of Arab GCC banking industry during the years of 1993–2002. Their results show that Kuwait, Saudi Arabia and UAE have moderately concentrated markets while those of Qatar, Bahrain and Oman are highly concentrated markets. Their results also suggest that banks in Kuwait, Saudi Arabia and the UAE operate under perfect competition while banks in Bahrain and Qatar operate under conditions of monopolistic competition.

The determinants of performance of European banks using a mixed logit approach are recently analyzed by Barros et al. (2007). Using a dataset on 1384 commercial banks operating in the European Union (EU) between 1993 and 2001, the authors corroborate the significance of country level characteristics (location and legal tradition), and firm-level features (bank ownership, balance sheet structure and size) as determinants of banking sectors performance.

Finally, Fu and Heffeman (2008) examine the relationship between market structure and performance of the Chinese banking system from 1985 to 2002. Using panel data techniques, both the market-power and efficient-structure hypotheses are tested. In addition, the model is extended to consider the impact of bank size/ownership and whether the big banks enjoy a “quiet life”. The study estimation of the structure–performance models lends some support to the relative market-power hypothesis in the early period.

In this study, we are going to utilize the most comprehensive approach suggested by Berger (1995) to investigate the SCP in Jordanian’s banking. A brief description of Berger’s model is described next.

4. The Market Power and Efficient Structure Model of the Study

Berger (1995) expands the market power model (MP) (which incorporates measures for only the traditional collusion hypothesis and the relative-market power hypothesis) to include efficiency measures ES (which incorporates X-efficiency and scale efficiency) as some authors have suggested these measures as an alternative explanation for the positive relationship between performance and measures of market power.

In this model, there are two main implications for the SCP relationship for mergers and antitrust policy: The first implication is based on the two market-power (MP) hypotheses: the first traditional hypothesis asserts that merger activity is motivated by the prospective benefits from greater market power created by increasing concentration. The second hypothesis is the relative-market power hypothesis (RMP) which asserts that merger activity is motivated by the prospective benefits from the greater market power created by market shares. The second implication is based on the two efficiency explanations of the positive relationship between profits and either concentration or market share: first, X-efficiency asserts that firms with superior management or production technology have lower costs and therefore higher profits, and second, scale-efficiency asserts that some firms simply produce at more efficient scales than others.

Berger’s (1995) main model, which measures bank profitability, is a single reduced form (π) that nests the four sub-hypotheses: traditional SCP hypothesis measured by concentration (CR), relative market power (RMP) hypothesis measured by market share (MS), and efficient structure (ESS) hypotheses represented by X-efficiency (EX) and scale efficiency (ES) as follows:

\[ \pi_{ij} = f(CR_j, MS_{ij}, ES_j, EX_j, X_{ij}) + e_i, \]

where \( \pi \) is the profit measure of bank \( i \) in market \( j \), CR is a measure of the market concentration, MS is a measure of market share of bank \( i \), ES is scale efficiency estimate of bank \( i \) and EX is X-efficiency estimate. \( X_i \) are a variety of control variables to account for firm and market specific characteristics that influence the bank profitability and \( e_i \) is an error term.

The structural model underlying the Efficient Structure (ES) hypotheses, X-efficiency (EX) and Scale efficiency (ES), is

\[ \pi_i = f_1(EFF_i, Z_{im}^1) + \epsilon_{im}^1 \]

\[ MS_i = f_2(EFF_i, Z_{im}^2) + \epsilon_{im}^2 \]

\[ CONC_m = f_3(MS_i, For\ All\ i\ in\ m) \]

where \( \pi \) measures profitability per unit of output, EFF reflects whichever efficiency concept is being modeled (EX or ES), the \( Z \) vectors represent control variables, the \( \epsilon_i \) are random errors, \( m \) indexes the market, and \( i \)
indexes the banks in market \( m \).

In equation (1), profits are determined by differences in cost efficiency, depending on the exact hypothesis EX or ES. In equation (2), more efficient firms have greater market shares. Profitability and market structure are spuriously positively related because \( \pi \), CONC, and MS are all positively related to efficiency; more efficient firms are more profitable in (1); more efficient firms have higher MS in (2); and MS is positively related to CONC in (3).

The model underlying the market-power (MP) hypotheses, SCP and RMP, is:

\[
\pi_i = f_4(P_i, Z_{im}^4) + \varepsilon_{im}^4 \quad (4)
\]

\[
P_i = f_5(\text{STRUC}_i, Z_{im}^5) + \varepsilon_{im}^5 \quad (5)
\]

\[
CONC_m = f_3(\text{MS}_i, \text{For All } i \text{ in } m) \quad (3)
\]

where \( P \) is a vector of output prices and STRUC is a measure of market structure, either CONC or MS. In equation (4), profits are primarily determined by differences in prices charged to consumers. In equation (5), prices are primarily determined by market structure.

Under RMP, MS is the key exogenous variable – firms with large market shares are able to exercise market power in pricing their products. Under the SCP, the positive profit-concentration relationship comes about because CONC affects \( P \) in equation (5) and \( P \) affects \( \pi \) in equation (4). Similarly, under RMP, the positive profit-market share relationship occurs because MS affects \( P \) in equation (5) and \( P \) affects \( \pi \) in equation (4).

The way in which the ES and MP hypotheses are usually tested employs a model that nests, but cannot distinguish among the hypotheses:

\[
\pi_i = f_7(CONC_m, MS_i, X - EFF_i, Z_{im}^7) + \varepsilon_i^7 \quad (7)
\]

This may be viewed as the reduced form for \( \pi \) of all four hypotheses, SCP, RMP, ESX and ESS, with some of the explanatory variables irrelevant for some of the hypotheses. An important limitation of the reduced-form profit equation in (7) is that it tests only one of the two necessary conditions of the ES hypotheses. To explain the spurious profit-structure relationship, both profits and the market structure must be positively related to efficiency. To test whether \( \text{EFF} \) is related to structure and \( \pi \), Berger estimates the reduced forms for CONC and MS from the ES model as:

\[
CONC_m = f_8(X - \text{EFF}_i, S - \text{EFF}_i, Z_{im}^8) + \varepsilon_i^8 \quad (8)
\]

\[
MS_i = f_9(X - \text{EFF}_i, S - \text{EFF}_i, Z_{im}^9) + \varepsilon_i^9 \quad (9)
\]

and tests whether the EFF coefficients are positive.

To the extent that MP hypotheses are correct, mergers may be motivated by desires to set prices that are less favorable to consumers. To the extent that the ES hypotheses are correct, these mergers may be motivated by efficiency considerations that would increase the total surplus.

5. Measurements of Variables in SCP Relationship

1st, the Bank Performance: there are a wide range of performance measures used in the context of SCP and these can be divided into two categories: those relating to the price of particular products or services and those relating to measures of profitability (Molyneux et al. 1996). The return on equity (ROE) and return on asset (ROA) will be used, in the present study, following Berger’s (1995) study, as measures of performance; the ratio of after tax net income to total equity (ROE) and the ratio of net income after tax to total assets (ROA).

2nd, Market Structure Measures: these can be described by the number of banks, the degree of market differentiation, the legal and supervisory framework and the level of integration within the market (Molyneux 1993). Due to the oligopolistic nature of banking markets,
most studies use market concentration as a measure of market structure. The present study measures the degree of concentration in the Jordanian’s banking sector using the Herfindahl index to estimate deposit concentration ratio. This index of oligopoly is one of the most frequently employed measures in banking literature. It is the sum of the squares of the market shares of all firms in a given market, such that \[ HHI = \sum_{i=1}^{n} P_i^2 \text{, where } P \text{ is the percentage of deposits or assets controlled by the } i^{\text{th}} \text{ firm and } n \text{ is the number of firms in the market.} \]

The market share in this study is measured as the bank’s deposits divided by the total market deposits, following Berger (1995). This will assist in explaining the relative market power hypothesis.

**3rd, Efficiency Measures**: several approaches have been developed for measuring efficiency, ranging from simple financial ratios to more complex econometric models. Cummins and Weiss (1998) indicate that there are two principal types of efficiency measurement: the econometric (Parametric) approach and the mathematical programming approach. The econometric approach requires the specification of production, cost, revenue or profit function as well as assumptions about the error term(s). The mathematical programming approach avoids this type of specification error by imposing less structure on the optimization problem.

**X-efficiency Measures**: X-efficiency provides a measure of how effectively banks are using their inputs to produce a given level of output and covers each firm’s technical and allocative efficiencies. It measures the deviation of a bank’s costs from the efficiency or “best practice” frontier (Berger and Humphrey, 1992).

In this study, we utilize the “distribution-free” method described in Berger (1993) to estimate X-efficiency scores. Rather than imposing predetermined distributions on the X-efficiencies and random error, this method identifies one from the other using the assumption that X-efficiency differences across firms should persist over time, while random error should average out over time.

The cost equations for each of the ten periods of a panel data set are specified as:

\[ OC_i = C_i (Y_{it}, w_{it}) X_{it}, v_{it}, \text{ or } \]

\[ \ln OC_i = \ln C_i(Y_{it}, w_{it}) + \ln x_i + \ln v_{it} \]  \hspace{1cm} (11)

where OC is operating costs, \( C(Y, w) \) is a cost function with output quantity and input price vectors \( Y \) and \( w \) as arguments, respectively, \( x \) is a multiplicative X-efficiency factor, \( \ln v \) is a mean-zero random error, and \( t \) indexes time. Equation (11) is estimated for each of the ten periods using a translog specification with two outputs and two input prices, treating \( \ln x + \ln v \) as a composite error term.

For each bank and time period, an average of the residuals from (11) for that bank for the nine other periods is formed. This average residual, \( \bar{\ln \hat{x}}_i \), is an estimate of \( \ln x_i \), given that the random errors \( \ln v_i \) will tend to cancel out each other out in the averaging. The \( \ln \hat{x}_i \) are transformed into a normalized X-EFF measure as follows:

\[ X - EFF_i = \exp(\ln x_{\text{min}}^{\text{est}} - \ln \hat{x}_i) \]  \hspace{1cm} (12)

where \( \ln x_{\text{min}}^{\text{est}} \) indicates the minimum \( \ln \hat{x}_i \) for all that i for that t. It may be seen that this is an estimate of \( \ln x_i^{\text{min}} / x_i \), the ratio of predicted costs for the most efficient bank in the sample to the predicted costs for bank i for any given vectors of outputs and input prices.

As noted above, X-EFF is positively related to current profits by theory, not identity. X-EFF could be unrelated to \( \pi \) if costs vary randomly over time for a given bank, instead of being persistently high or low relative to other banks because of the talents of the bank’s managers. X-EFF could also be unrelated to \( \pi \) if more X-efficient banks tended to have offsetting lower revenues or if variations in revenues or if variations in revenues simply overwhelmed variations in costs.

**Scale Efficiency**: Scale efficiency measures whether firms with similar production and managerial technologies are operating at optimal economies of scale. Different approaches have been used to study Scale efficiency.

Humphrey (1987) estimates scale efficiency by examining the cost dispersion among banks of similar size. To estimate scale efficiency, Humphrey uses asset cost elasticities (ASCE), which show how much costs change as a bank grows. ASCE is simply the ratio of the percentage change in bank operating and interest costs to the percentage change in bank asset size. If ASCE is less than 1, economies of scale exist as average costs fall for large-sized banks. In the present study, scale efficiencies are computed from the cost function in equation (11) as well.

Scale efficiency was determined as the ratio of predicted costs to predicted costs for the bank’s actual output \( Y \), multiplied by the ratio of outputs to correct for absolute size differences:
\[ S - EFF = \exp\left(\ln \hat{C}(Y^{se}, w) - \ln \hat{C}(Y, w)\right) \left(\frac{\sum_{j=1}^{5} Y_j}{\sum_{k=1}^{5} Y_k^{se}}\right), \]  \hspace{1cm} (13)\]

Where the \( \ln \hat{C} \)s are predicted cost values. It may be seen that this is an estimate of \( A\hat{C}^{se}/A\hat{C} \), the ratio of minimum predicted average costs to the actual predicted average costs for bank is output mix and input prices. As with any efficiency measure, S-EFF ranges over \((0,1]\).

We also distinguish between scale economy efficiency for banks that are below efficient scale, and scale diseconomy efficiency for banks that are above efficient scale. Let
\[ S - EFF^e = \begin{cases} \frac{S - EFF}{1} & \text{if} \ Y < Y^{se} \text{ and} \\ \text{and} & \end{cases} \]  \hspace{1cm} (14)\]
\[ S - EFF^d = \begin{cases} 1 & \text{if} \ Y < Y^{se} \text{ and} \\ S - EFF & \text{if} \ Y \geq Y^{se} \end{cases} \]  \hspace{1cm} (15)\]

measure scale efficiency from having unexploited scale economies and diseconomies, respectively. By construction, a firm that is measured to have unexploited scale economies is also measured as having no scale diseconomies, and vice versa.

In the empirical analysis, S-EFF\(^e\) and S-EFF\(^d\) are included in place of S-EFF because they probably have different implications under the scale version of the efficient-structure (ESS) hypothesis. Presumably, advocates of ESS have in mind that firms in the scale economy region grow larger and more profitable and at the same time increase their MS and their market’s CONC, creating the spurious positive profit-structure relationship. In contrast, firms in the scale diseconomy region would have to shrink to increase scale efficiency and profits. Thus, the ESS hypothesis would appear to refer primarily to the effects of S-EFF\(^e\), rather than S-EFF\(^d\).

**Control Variables:** The SCP models include a series of control variables that are believed to influence the relationship between market structure and performance. Such variables account for firm and market specific characteristics such as ownership structure, entry conditions, financial risk, and differences in size. The control variables are also used to control for the different risk characteristics associated with individual banks (Molyneux, et al., 1996).

Since the present study involves only the local banks operating in Jordan that are subject to almost same regulatory procedures and conduct similar activities and roles, we utilize only two control variables. The first is the market growth measured by the annual growth of each bank deposits over the study period. The study also includes a time trend to account for technical change when we estimate efficiency measures for the banks under study.

### 6. Data Description

The present study sample is composed of all the sixteen local banks in Jordan over the period 2001 to 2005. These banks include the commercial, Islamic and Joint ownership banks operating in the market over the study period. Thus, the sample accounted for about 100 percent of all domestic banks’ assets. The study data consist of selected items taken from published consolidated balance sheets and income statements of the banks on 31 December for the banks under study.

Over the study period, the Jordanian’s banking industry has witnessed important changed represented by rapid expansion of banking activity and appearance of new financial banks. For instance, the size of assets held by the local banks grow from around JD 23.4 trillion in year 2001 to around JD 30.7 trillion in 2005. Furthermore, four new foreign banks entered into the market in the year 2004. These significant developments suggest that these structural changes should be guided in order to protect the viability of the banking system as a regulated industry.

Table (1) shows the definitions and sample means of the variables of the banks under study. The profitability measures, after-tax ROA and ROE are standards in banking research. The market structure variables are defined by the deposits in the local market. The Herfindahl index (HERF) is used as a measure of concentration. For both the CONC and MS measures, we take the average for a bank over the local market in which it has deposits, weighted by the proportion of the bank’s deposits in the market.
### Table 1. Variables Used in Efficient-Structures and Market-Power Hypotheses Tests

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Definition</th>
<th>Mean</th>
<th>Median</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA</td>
<td>Ratio of net after-tax income to assets.</td>
<td>0.013</td>
<td>0.011</td>
<td>0.079</td>
<td>-0.055</td>
<td>0.015</td>
</tr>
<tr>
<td>ROE</td>
<td>Ratio net after-tax income to equity.</td>
<td>0.107</td>
<td>0.096</td>
<td>0.399</td>
<td>-0.102</td>
<td>0.088</td>
</tr>
<tr>
<td>Conc.</td>
<td>Herfindahl Index of concentration, weighted by the proportion of the bank’s deposits in its market.</td>
<td>0.514</td>
<td>0.527</td>
<td>0.589</td>
<td>0.395</td>
<td>0.074</td>
</tr>
<tr>
<td>X-Eff</td>
<td>X-efficiency: ratio of the smallest four-average multiplicative cost function residual of banks to the bank’s four-year average residual.</td>
<td>0.671</td>
<td>0.665</td>
<td>1.000</td>
<td>0.430</td>
<td>0.154</td>
</tr>
<tr>
<td>Scale-Eff</td>
<td>Scale efficiency: ratio of predicted unit cost for a scale-efficient firm with the same product mix and input prices to the bank’s predicted unit cost.</td>
<td>0.892</td>
<td>0.900</td>
<td>0.930</td>
<td>0.760</td>
<td>0.031</td>
</tr>
<tr>
<td>Scale-Eff^a</td>
<td>Scale economy efficiency: equals S-EFF if bank is below efficient scale; equals 1 otherwise</td>
<td>0.911</td>
<td>0.900</td>
<td>1.000</td>
<td>0.760</td>
<td>0.057</td>
</tr>
<tr>
<td>Scale-Eff^d</td>
<td>Scale diseconomy efficiency: equals S-EFF if bank is above efficient scale; equals 1 otherwise</td>
<td>0.981</td>
<td>1.000</td>
<td>1.000</td>
<td>0.920</td>
<td>0.034</td>
</tr>
<tr>
<td>MS</td>
<td>The proportion of the bank’s deposit in the whole market deposit.</td>
<td>0.073</td>
<td>0.021</td>
<td>0.743</td>
<td>0.000</td>
<td>0.164</td>
</tr>
<tr>
<td>MKTGROWTH</td>
<td>Growth of deposits in bank’s markets.</td>
<td>0.080</td>
<td>0.080</td>
<td>0.102</td>
<td>0.061</td>
<td>0.013</td>
</tr>
<tr>
<td>T</td>
<td>Time Trend</td>
<td>3</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>1.423</td>
</tr>
</tbody>
</table>

### Table 2. Regressions of ROA on Concentration and Market Share

**Method**: Panel Least Squares; **Sample**: 2001-2005  
**Cross-sections included**: 16; **Total panel (balanced) observations**: 80

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONC</td>
<td>0.0858**</td>
<td>0.0217</td>
<td>3.9498</td>
</tr>
<tr>
<td>MS</td>
<td>-0.0086</td>
<td>0.0097</td>
<td>-0.8917</td>
</tr>
<tr>
<td>MKTGROWTH</td>
<td>-0.2527**</td>
<td>0.1203</td>
<td>-2.1007</td>
</tr>
<tr>
<td>R^2/Num. Obs.</td>
<td>0.199/80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(**) Significantly different from zero at the 10 (5) percent significant level, two-sided. Not shown, the intercept is included.

### Table 3. Regressions of ROE on Concentration and Market Share

**Method**: Panel Least Squares; **Sample**: 2001-2005  
**Cross-sections included**: 16; **Total panel (balanced) observations**: 80

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONC</td>
<td>0.5303**</td>
<td>0.1209</td>
<td>4.3868</td>
</tr>
<tr>
<td>MS</td>
<td>-0.0192</td>
<td>0.0538</td>
<td>-0.3573</td>
</tr>
<tr>
<td>MKTGROWTH</td>
<td>-1.6519**</td>
<td>0.6694</td>
<td>-2.4679</td>
</tr>
<tr>
<td>R^2/Num. Obs.</td>
<td>0.234/80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(**) Significantly different from zero at the 10 (5) percent significant level, two-sided. Not shown, the intercept is included.

The X-EFF variable indicates substantial inefficiency in the banking industry, consistent with previous research. The S-EFF variable indicates scale inefficiencies of around 10 percent on average, with more than 90 percent of the banks measured as being below efficient scale.

Finally, two control variables are included: the growth of deposits for each bank over the study period and a time trend.

### 7. EMPIRICAL RESULTS

Our analysis focuses on estimating the reduced-form equation (7), in which profitability (\( \pi \)) is regressed on
concentration (CONC), market share (MS), efficiency (EFF), and control variables (Z). However, we first regress \( \pi \) on just CONC, MS, and Z as in equation (6) to replicate the literature that finds MS to dominate CONC and interprets this as supporting any of three of the four hypotheses. These regressions are shown in Tables 2 and 3, with ROA and ROE specified as the \( \pi \) variable, respectively.

### Table 4. Regressions of ROA on Concentration, Market Share, and Efficiency

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONC</td>
<td>0.0962**</td>
<td>0.0227</td>
<td>4.2317</td>
</tr>
<tr>
<td>MS</td>
<td>-0.0131</td>
<td>0.0096</td>
<td>-1.3599</td>
</tr>
<tr>
<td>X-EFF</td>
<td>-0.0021</td>
<td>0.0110</td>
<td>-0.1932</td>
</tr>
<tr>
<td>S-EFF</td>
<td>0.1742**</td>
<td>0.0618</td>
<td>2.8175</td>
</tr>
<tr>
<td>S-EFFd</td>
<td>0.1920*</td>
<td>0.1058</td>
<td>1.8134</td>
</tr>
<tr>
<td>MKTGROWTH</td>
<td>-0.2469**</td>
<td>0.1166</td>
<td>-2.1171</td>
</tr>
<tr>
<td>( R^2/\text{Num. Obs.} )</td>
<td>0.300/80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(**) Significantly different from zero at the 10 (5) percent significant level, two-sided. Not shown, the intercept is included.

Note that the increase in \( R^2 \) in this model over the \( R^2 \) in the model presented in table 2 indicates the ability to improve profits through efficiency.

### Table 5. Regressions of ROE on Concentration, Market Share, and Efficiency

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONC</td>
<td>0.5305**</td>
<td>0.1343</td>
<td>3.9486</td>
</tr>
<tr>
<td>MS</td>
<td>-0.0298</td>
<td>0.0570</td>
<td>-0.5221</td>
</tr>
<tr>
<td>X-EFF</td>
<td>0.0653</td>
<td>0.0649</td>
<td>1.0064</td>
</tr>
<tr>
<td>S-EFF</td>
<td>-0.0481</td>
<td>0.3653</td>
<td>-0.1316</td>
</tr>
<tr>
<td>S-EFFd</td>
<td>-0.0095</td>
<td>0.6256</td>
<td>-0.0153</td>
</tr>
<tr>
<td>MKTGROWTH</td>
<td>-1.6784**</td>
<td>0.6892</td>
<td>-2.4352</td>
</tr>
<tr>
<td>( R^2/\text{Num. Obs.} )</td>
<td>0.245/80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(**) Significantly different from zero at the 10 (5) percent significant level, two-sided. Not shown, the intercept is included.

### Table 6. Regressions of CONC on X-EFF, Scale-EFF\(^e\) and Scale-EFF\(^d\)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-EFF</td>
<td>-0.007</td>
<td>0.055</td>
<td>-0.128</td>
</tr>
<tr>
<td>S-EFF(^e)</td>
<td>-0.772**</td>
<td>0.299</td>
<td>-2.584</td>
</tr>
<tr>
<td>S-EFF(^d)</td>
<td>-1.748**</td>
<td>0.489</td>
<td>-3.577</td>
</tr>
<tr>
<td>MKTGROWTH</td>
<td>0.816</td>
<td>0.590</td>
<td>1.384</td>
</tr>
<tr>
<td>( R^2/\text{Num. Obs.} )</td>
<td>0.166/80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(**) Significantly different from zero at the 10 (5) percent significant level, two-sided. Not shown, the intercept is included.
Table 7. Regressions of MS on X-EFF, Scale-EFF\textsuperscript{e} and Scale-EFF\textsuperscript{d}

<table>
<thead>
<tr>
<th>Method: Panel Least Squares</th>
<th>Sample: 2001-2005</th>
<th>Cross-sections included: 16; Total panel (balanced) observations: 80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Coefficient</td>
<td>Std. Error</td>
</tr>
<tr>
<td>X-EFF</td>
<td>0.212</td>
<td>0.130</td>
</tr>
<tr>
<td>S-EFF\textsuperscript{e}</td>
<td>0.912</td>
<td>0.704</td>
</tr>
<tr>
<td>S-EFF\textsuperscript{d}</td>
<td>1.927*</td>
<td>1.152</td>
</tr>
<tr>
<td>MKTGROWTH</td>
<td>-0.293</td>
<td>1.390</td>
</tr>
<tr>
<td>R\textsuperscript{2}/Num. Obs.</td>
<td>0.070/80</td>
<td></td>
</tr>
</tbody>
</table>

*(*)(**) Significantly different from zero at the 10 (5) percent significant level, two-sided. Not shown, the intercept is included.

These results suggest some inconsistency with the literature that finds a positive and statistically significant MS (not CONC) coefficient. In both models above, CONC coefficients are found to be statistically significant while the MS coefficients are found to be statistically insignificant. These results support the traditional SCP which presumes a positive relationship between concentration and profitability.

Tables (4 and 5) show the complete reduced form π regressions with CONC, MS, and the EFE measures, as in equation (7). These provide more definitive results because they incorporate the reduced forms for all four hypotheses. Each coefficient gives the marginal effect of one hypothesis on profitability.

The concentration results in Tables (4 and 5) show that the coefficients of this variable are positive and statistically significant (and are approximately unchanged from the previous equations that excluded the EFF variables). Since efficiency is controlled for in these regressions, these results suggest that MP (represented by the traditional SCP hypothesis) may explain the profit-structure relationship. That is, CONC appears to represent market power of the larger firms in the market rather than efficiency which is controlled for here (note, scale efficiency is statistically significant only in the first model –table 4).

The fact that the CONC and MS coefficients did not change substantially when the EFF variables were added to the regressions (compare table 2&3 with tables 4&5) also suggests that CONC coefficients in the specified equation without the EFF variables do not reflect the effects of efficiency, as argued by ES advocates.

The X-efficiency results in Tables (4 and 5) reveal that the X-EFE coefficients are negative in the first regression model, positive in the second model and in both situations are statistically insignificant. These results suggest that X-EFF inconsistently helps explain profits. This result goes against the efficient-structure model which indicates that efficiency is the major determinant of profits. This conclusion might be confirmed from the results related to scale efficiency below.

Turning to the scale efficiency results, the coefficients of S-EFF\textsuperscript{e} are positive and statistically significant in the first regression model (table 4) but positive and statistically insignificant in the second model (table 5). Similar results are found for the scale diseconomy efficiency. These results provide support to the MP (the traditional SCP) hypothesis, and less important support to the ESS hypothesis.

The less important support to ESS hypothesis derives from the inconsistent findings that the R\textsuperscript{2} increases substantially when efficiency measures are added to the model (when ROA is used as measure of profitability in table 4) but the R\textsuperscript{2} does improves substantially when efficiency measures are added in the second model (when ROE is utilized as a measure of profitability).

The large, positive value for the CONC coefficients is consistent with the traditional SCP hypothesis as concentration having the greatest influence on profitability. A one percentage changes in CONC would substantially increase ROA or ROE. However, the impacts of other variables are relatively less significant on either ROE or ROA. Thus, the current Jordanian’s banking environment helps the operating banks to achieve higher monopolistic profits due to high levels of concentrations.

Investigating the effects of EFF further by rerunning their equations with CONC and EFF included, but with MS excluded. The results show that the CONC coefficients are positive and similar to the regressions with MS and EFF (neither set of results are shown). This confirms the finding that only market power effects through CONC is responsible for a positive profit concentration relationship.
Finally, we examine the other necessary condition of the ES hypotheses, that efficiency affects market structure, as shown in the reduced forms for CONC and MS in equations (8) and (9). That is, if EFF explain the positive profit structure relationship, it must be positively related to CONC or MS as well as to $\pi$. These regressions are shown below:

As shown above, when CONC and MS are regressed on efficiency measures, inconsistent results are obtained. When CONC is regressed on efficiency measures, coefficients of S-EFF$^a$ and S-EFF$^d$ are found to be negative and statistically significant while the X-EFF coefficient is statistically insignificant and very small quantitatively. As for the MS regressions on efficiency measures, only S-EFF$^d$ is found to be statistically significant at the 10 percent significant level. This confirms the results discussed earlier that provide little support for the ES hypotheses.

In the analysis above, profits are always positively associated with concentration not the market share even when the efficiency measures are added to the model (Table 4 and 5), suggesting that it was market power effects captured by CONC, not efficiency, that drove the profit-concentration relationship.

8. IMPLICATIONS OF THE RESULTS AND CONCLUSION

This paper enters the debate between market-power (MP) and efficient-structure (ES) explanations of the profit-structure relationship in Jordanian’s banking by adding direct measures of both X-efficiency and scale efficiency to the empirical analysis. Tests of two MP and two ES hypotheses are performed by regressing profits against measures of concentration, market share, X-efficiency, and scale efficiency. Concentration and market share are also regressed against the efficiency variables to test the necessary condition of the ES hypotheses that efficiency affects market structure.

The empirical results generally support the traditional SCP hypothesis, with inconsistent support to the scale-efficiency version of the efficient structure (ESS) in the Jordan’s banking industry over the study period. Concentration is positively related to profitability in all cases after controlling for the effects of market share and efficiency. In addition, our results do not provide support for the relative-market power hypothesis (RMP). X-efficiency or superior management of resources is also found to be not associated with higher profits, when controlling for the effects of the other three hypotheses.

These results suggest that merger activity occurred and might again occur in the near future in Jordan’s banking industry is motivated by the prospective benefits from greater market power created by increasing the concentration. Thus, the concentration in this market enables the operating banks to set prices that are less favorable to consumers (lower deposit rates, higher loan rates) as a result of competitive imperfections in this market.

On this basis, the policymakers of Jordanian’s banking sector should expand ongoing deregulation efforts with the aim of reducing the industry concentration and increasing the market competitiveness. In particular, new policies should be directed at encouraging market entry and abolishing the legal and regulatory obstacles to competition.

REFERENCES


