

# “Structure and profitability in the banking sector”

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# STRUCTURE AND PROFITABILITY IN THE BANKING SECTOR

## Abstract

The relationship between profit and bank market structure continues to raise questions amongst both policy makers and researchers. While some evidence supports a positive relationship between market structure, competition and profitability, other evidence seems to support the fact that profitability and related market share result from efficiency. Moreover, extant literature on South Africa is conflicting and seems to contradict anecdotal evidence. While some studies point to a competitive environment despite concentration, others suggest that concentration in the banking sector is harmful. Prosecution of banks for uncompetitive behavior also casts doubt on the conclusion that the South African banking sector is competitive. This paper examines the relationship between structure and conduct in the South African banking sector. Using the Berger (1995) discriminating tests, the effect of industry concentration, market share and efficiency on three measures of profitability is estimated on a panel of 11 South African banks for data between 1994 and 2016. The results show that concentration affects conduct. The profit-structure relationship is dominantly explained by the structure conduct hypothesis and partly by the efficient scale hypothesis. These results suggest that policy which discourages concentration and promotes competition in the banking sector is socially beneficial.

## Keywords

market structure, profitability, competition, South  
Africa, banks

## JEL Classification

G21, L11, L16

## INTRODUCTION

Much literature has established a positive association between financial sector development and economic growth (King & Levine, 1993a, 1993b; Levine, 2005). Although the financial sector in general enables economic growth, job creation and the building and expansion of vital infrastructure, banks remain at the heart of all developing and emerging country financial systems. Banks enable the functioning of the payment system, the transmission of monetary policy and are the primary entry point into the financial sector for the majority of small, medium and micro enterprises (SMMEs) and of middle and low income households. Consequently, SMMEs and households are directly affected by the performance, conduct and other related behavior of banks. If banks operate efficiently, such gains can be passed to consumers of banking services and will result in greater access, usage and consequent growth.

An uncompetitive banking sector can lead to under-provision and other anticompetitive behavior such as the setting of very high fees (Claessens & Laeven, 2005; Crotty, 2008). Moreover, banks are the primary channel for monetary policy. The effectiveness of monetary policy to a large extent depends on the banks' market power and the consequent impact on the loan and deposit markets (Bikker, 2004)<sup>1</sup>. Furthermore, the literature indicates a strong empirical association between banking structure and economic growth (Levine et al., 2000). Understanding the structure and conduct of the banking sector should, therefore, be of interest to both academics and policy makers.

<sup>1</sup> Kot (2004) finds a positive relationship between competition and monetary policy transmission.

## 1. BANKING AND COMPETITION IN SOUTH AFRICA

The South African banking system is well-developed and regulated. However, it has also been argued that it is characterized by high and opaque fees (National Treasury, 2011). The government responded by reviewing the regulations and prioritizing prudential and market conduct regulation to the introduction of the “Twin Peaks model” of financial regulation<sup>2</sup>. The new framework is intended to promote greater competition and lower bank fees. Despite these important policy changes, there is a dearth of empirical evidence in the conduct and performance of banks in South Africa. Known empirical studies include Simatele (2015), Simbanegavi et al. (2015), Mlambo and Ncube (2011) and Okeahalam (2001). Mlambo and Ncube (2011) also incorporate efficiency in their analysis.

In 2004, the government commissioned an enquiry into the nature of competition in the country (National Treasury, 2011). Using index measures such as the Herfindahl – Hirschman index (HHI), the report concludes that the banking sector in South Africa is highly concentrated. Only Okeahalam (2001) and Okeahalam (2004) explicitly take concentration into account. The argument that concentration leads to uncompetitive prices is an empirical question. If it holds, then there is a reason for breaking up larger firms and denying mergers. If, on the other hand, concentration is not positively correlated to profitability and by inference prices, then breaking down large banks may lead to higher prices and a reduction in consumer surplus. Moreover, the popular finding that the South African banking sector exhibits characteristics of monopolistic competition has been brought into question by the recent Competition Commission of South Africa enquiry into price fixing in foreign exchange trading amongst various banks in South Africa (Competition Commission South Africa, 2017).

## 2. A BRIEF LITERATURE REVIEW

Early surveys of the literature include Rhoades (1982) and Gilbert (1984). Gilbert (1984) is probably the most comprehensive of these. He reviews early studies of US banks and finds that 32 out of the 44 studies support the Structure Conduct Performance (SCP) hypothesis. Studies using European data also find support for the SCP (Molyneux & Forbes, 1995; Molyneux et al., 1996). Shaffer (2004) offers a more recent review. This review focuses more on the new empirical industrial organization studies. However, it provides a relatively comprehensive review of the structure conduct performance from both a theoretical and empirical perspective.

Structure has traditionally been linked to the conduct of firms in an industry. In the banking sector, the debate still lacks consensus. On the one hand, studies such as Cetorelli (2002), Cetorelli and Strahan (2006) argue that higher levels of bank concentration imply less entry and growth of younger banks. From the user perspective, Cetorelli and Strahan (2006), Demirgüç-Kunt and Maksimovic (1998) suggest that bank concentration negatively affects access to finance for small firms and is a detriment to entrepreneurship. Theoretically, such studies are founded in the SCP or market hypothesis. On the other hand, it has been argued that high concentration in the banking sector does not necessarily imply a lack of competition. Some theoretical perspectives predict outcomes different from that of the traditional structural models. For example, contestable markets (Baumol et al., 1982) and the classic Bertrand equilibrium model under constant marginal cost will yield competitive pricing even with a concentrated market (Shaffer, 2004).

Early empirical work seems to support both perspectives with varying degrees of strength in the tests employed. Studies based on structural models typically indicate that bank concentration affects the conduct of banks. Structural conduct performance studies in industrialized countries have also shown that the level of competition can be high in the presence of high concentration. Nathan and

<sup>2</sup> The twin peaks model proposes to set up two separate bodies to conduct prudential regulation and market conduct. This would result in two separate bodies comprised of the existing Financial services board and the new Financial Sector Conduct Authority.

Neave (1989), Shaffer (1993) find highly competitive conduct amongst Canadian banks despite the high level of concentration. These discrepant results have led more recent studies to the use of non-structural approaches to understanding competition in the banking sector. Most of these studies use the Panzar-Rosse and Bresnahan-Lau approaches (Bresnahan, 1982; Lau, 1982; Panzar & Rosse, 1987; Rosse & Panzar, 1977). Though advantageous in their non-structural approach, these approaches are not immune to shortcomings. Bikker et al. (2012) and Bikker et al. (2007) suggest that the findings of a number of studies that have scaled the revenue equation such as Shaffer (2004), Nathan and Neave (1989), Claessens and Laeven (2004) and Carbó et al. (2009) can be disqualified as the results may be spurious. Another criticism is that the existence of a higher concentration may indeed lead to higher prices but this does not imply higher profit. Contestable markets may entail zero profits even in the presence of oligopolistic competition.

More recent studies have tested the efficient structure hypothesis embedded in the SCP paradigm. Both the traditional SCP (henceforth the market power) hypothesis and the efficient structure hypothesis<sup>3</sup> conject that there is a relationship between structure and performance. While the former suggests that concentration or higher market shares are harmful because they lead to inefficiency and the detrimental use of market power, the later suggests that concentration can lead to increased welfare gains through lowering costs. The two hypotheses also differ in the direction of causality. While the market power hypothesis argues that concentration negatively affects efficiency, the efficient structure hypothesis argues that it is the efficiency of banks that allows them to get a larger share of the market and, therefore, lead to concentration. Researchers have tested between these two paradigms using the tests provided by Smirlock (1985), Berger and Hannan (1993) and Berger (1995). Smirlock (1985) asserts that market concentration is not a random event. Rather it is the result of firms' superior efficiency resulting in a larger market share so that efficiency is driving both profits and market share. The discriminating tests introduced by Berger (1995) take this

into account. Depending on which hypothesis the results support, two possible policy implications arise; if the market power SCP hypothesis is correct, antitrust enforcement is socially beneficial. If the efficient structure hypothesis is correct, policies which inhibit mergers and consolidation are socially costly.

Empirical results are mixed but are generally in support of the impact of structure on performance. Recent studies that support the market power hypothesis in the context of developing and emerging economies include Mirzaei et al. (2013), Kamau and Were (2013) and Khan et al. (2016). The Mirzaei et al. (2013) study shows that market power not only affects performance directly but also indirectly through interaction with variables such as bank age, ownership status and regulation. Related studies which support the efficient market hypothesis include Pruteanu-Podpiera et al. (2016), Homma et al. (2014). Market concentration is found to be negatively related to efficiency and direct measures of competition. These results indicate that structure has an effect on performance. The channel through which this happens, however, still remains an empirical question. The answers offer possibilities for debates on antitrust policy issues.

The objective of this paper is to analyze the relationship between performance and market structure in the banking sector in South Africa. The discriminating tests introduced by Bresnahan (1982) and Berger (1995) are used. This study adds to the existing knowledge in two ways. Firstly, it adds new information by explicitly testing the market power and relative efficiency hypothesis in the South African context. Moreover, market concentration is explicitly tested in the spirit of structural models unlike previous studies looking at bank competition in South Africa. Consequently, it is possible to suggest unambiguous policy implications regarding antitrust practices in the banking sector. Secondly, the study complements the few empirical studies in South Africa in this area. The results in Simbanegavi et al. (2015) are mixed; the Panzar-Rosse test indicates monopolistic competition, while the Bresnahan-Lau test suggests that perfect competition cannot be rejected. Simatele

3 The efficient structure hypothesis embeds both the X-efficiency and scale efficiency hypotheses as discussed below.

(2015), Mlambo and Ncube (2011) suggest that the sector exhibits characteristics of monopolistic competition.

Okeahalam (2001) and Okeahalam (2004) are the only studies available that use the structure conduct approach on South African data. The results in these studies show that concentration is positively related to bank profitability. Of the three multi-country studies that include South Africa, Okeahalam (2004) finds a positive correlation between concentration and pricing in the South African banking sector, a result of anti-competitive behavior. Claessens and Laeven (2005) and Bikker et al. (2012) indicate the presence of monopolistic competition. Bikker et al. (2012), however, indicate that the Claessens and Laeven (2005) results may be spurious due to the scaling of the dependent variable. The Bikker et al. (2012) study suggests some competition in the South African sector but indicates an absence of long-run equilibrium. Moreover, conclusions about the presence of monopolistic competition in the South African banking sector have to be questioned in the presence of current probes into the conduct of banks in the South African Competition commission<sup>4</sup>. The discussion on structure and competition in South African banking sector is, therefore, far from conclusive. This paper adds to this debate.

### 3. METHODOLOGICAL ISSUES

The brief literature review above shows that non-structural approaches almost always suggest monopolistic competition in the banking sector for South Africa. Recent events, however, suggest that this may not be an accurate reflection of the nature of the banking industry in South Africa. The study explicitly models market power theories (traditional SCP and relative market power) and the efficiency structure paradigm (X-efficiency and scale efficiency theories). The market power theories indicate that changes in the market structure of banks affect the way they behave. The more concentrated markets would tend to be more profitable because they can ex-

tract monopolistic rents. This can be done, for example, by offering lower deposit rates and higher lending rates. The traditional SCP hypothesis predicts that collusive behavior of dominant firms influences the price setting process and through that, the extraction of monopolistic rents allows the banks to gain superior profits in the industry.

The relative market power hypothesis, on the other hand, argues that banks with higher market share and more differentiated products will tend to exert more power, thereby deriving higher profits irrespective of the level of concentration in the market. The essential difference between these two variations of the structural conduct hypothesis is whether market power is generic to the market or specific to those banks that are distinguished based on their share of the market or a larger pool of differentiated products. One of the key criticisms of the SCP paradigm in the literature is that both conduct and structure could be endogenous. This assumption holds under the assumption of free entry and exit and constant costs. The Berger (1995) test used in the paper allows this to be taken into account.

In the efficient structure hypothesis, causation runs from efficiency to profit; more efficient banks would tend to be more profitable. Consequently, efficiency may result in higher market shares and concentration. The observed positive relationship between profits and concentration is, therefore, not necessarily an indicator of market power but rather a result of efficiency exhibited in lower costs. Smirlock (1985) uses the market share to proxy for efficiency. However, the correct interpretation of the resulting coefficient is ambiguous as it depends on whether market size is a good proxy for efficiency or not. Given that this variable is also interpreted to support the relative market power hypothesis, it is important to have explicit inclusion of efficiency measures in order to be able to discriminate amongst the different hypotheses. This approach is used in the paper based on the work of Berger and Hannan (1993) and Berger (1995). Explicit measures of efficiency, taking into account both X-efficiency and scale efficiency, are included.

<sup>4</sup> The South African Competition commission referred 17 banks the competition tribunal for prosecution in the currency markets. It is alleged that the collusion started in 2007 (Ross, 2017).



## 4. ESTIMATION AND VARIABLES

The empirical model follows the Berger (1995) as represented in equation 1

$$\pi_i = f(\text{CONC}, \text{MS}, \text{XEFF}, \text{SEFF}, Z) + \varepsilon_i, \quad (1)$$

where  $\pi$  is a measure of firm performance,  $\text{CONC}$  is the concentration measure,  $\text{MS}$  is the market share,  $\text{XEFF}$  is the measure of X-efficiency and  $\text{SEFF}$  is the measure of scale efficiency. The X-efficiency measure shows a bank's capacity to produce a given level of output at minimum cost due to superior management capacity or technology. Scale efficiency, on the other hand, shows a bank's capacity to produce at optimal output given a fixed level of technology.  $Z$  captures different bank specific control variables such as the risk related measures.

Data on 11 South African banks is used in the paper, covering the period 1994 to 2016. The panel is unbalanced due to limited data and the entry and exit of banks overtime, especially during the South African domestic currency crisis of 2001/2002. The start year of 1994 is chosen as it represents the end of Apartheid and the full<sup>5</sup> incorporation of South Africa into free trade with international community. The General Methods of Moments (GMM) estimator was employed to analyze the data following Roodman (2009)<sup>6</sup>. The use of the GMM estimator is motivated by the fact that the fixed effects model which is common in literature ignores the possibility of Nickell bias especially in samples of small  $T$  and large  $N$  (Nickell, 1981). In this study, our  $T$  is relatively large ( $T = 23$ ) and larger than  $N$  ( $N = 11$ ), therefore in principle Nickell bias is not a major threat (Roodman, 2009). However, the bias may be introduced by use of fixed effects because of the demeaning operation which creates a regressor that cannot be distributed independently of the error term. The use of GMM accounts for this possible bias.

Equation 1 can be expressed empirically as indicated in equation 2. It nests two specific paradigms each with 2 hypotheses. This gives a total of four hypotheses to be tested.

$$\pi_i = \alpha_0 + \alpha_1 \text{CONC}_i + \alpha_2 \text{MS}_i + \alpha_3 \text{XEFF}_i + \alpha_4 \text{SEFF}_i + \alpha_5 \sum_{i=1}^n \phi_i Z_i + \varepsilon_i. \quad (2)$$

### The structure conduct performance paradigm

*The traditional structure conduct hypothesis:* this predicts that collusive behavior of dominant firms influences the price setting process and, therefore, allows these firms to gain superior profits over other firms in the industry. The relationship between the bank performance variable and market concentration is expected to be positive.  $H_0: \alpha_1 > 0$ .

*Relative market hypothesis:* firms with a higher market share and more differentiated products will tend to exert more market power and, therefore, earn more profits, independent of how concentrated the market is. Market size is used to proxy this source of power. Banks with large market shares will tend to have differentiated products resulting from advertising, location and other related advantages. Therefore, a positive relationship is expected between bank performance and the market share variable (bank size). Further, a measure of product diversification in the form of revenue HHI has been calculated and a positive relationship is expected.  $H_0: \alpha_2 > 0$ .

### The efficient structure paradigm

*The relative X-efficiency hypothesis:* firms which have more X-efficiency have lower costs, higher profits and higher market shares. This results from their ability to harness superior management or better technology which may lead to greater concentration as the resultant lower costs translate into lower product prices and larger market shares. Therefore, the relationship between the X-efficiency variable and bank performance should be positive.  $H_0: \alpha_3 > 0$ .

*The relative scale efficiency hypothesis:* banks are assumed to have similar management and technology but different scale economies. Those banks producing output at levels that are closer to the minimum efficient scale or average cost will

5 The process started in 1990, and political leadership and regime changed in 1994.

6 Roodman (2009) argues that the GMM estimator is a more reliable technique when there is a possibility of endogeneity and the influence of past values of the dependent variable.

**Table 1.** Summary statistics

| Variables | Minimum  | Maximum  | Mean        |
|-----------|----------|----------|-------------|
| HHI       | .13      | .19      | .1704469    |
| SIZE      | 2.960105 | 15.1489  | 10.93918874 |
| LTA       | .0010915 | 88.36788 | 1.4166      |
| LORG      | .01      | 31.38    | 5.962719    |
| CTI       | 23.0     | 350      | 62.9931     |
| RevC      | .5000004 | 10.78202 | .89361      |
| DTA       | 0        | 75.86011 | .873891     |
| XEFF      | .0133    | 1.3399   | .95714      |
| SEFF      | .0506    | 114.420  | 3.0135      |
| TRE       | 0        | 114.8    | 22.0014     |
| TE        | 31.2     | 152648   | 15893.11    |

achieve greater efficiency, therefore, they will have lower costs and higher profits. This may in the end lead to higher market shares and greater concentration. Therefore, the relationship between bank performance and the variable that measures scale efficiency should be positive.  $H_0: \alpha_4 > 0$ .

#### 4.1. Variable definition

##### 4.1.1. Dependent variables

The dependent variable is measured by bank performance. To measure performance, the study uses three alternative measures of bank performance. These include return on assets (*ROA*), return on equity (*ROE*) and net interest margin (*NIM*) following literature. This use of profit measures is in line with literature which indicates preference over price measures in analysis where firms have differentiated products or have multi-products as is the case in the banking industry.

##### 4.1.2. Explanatory variables

The first set of variables are those which measure concentration; the  $CR_k$  and *HHI* measures. The concentration measure used in the study is the *HHI*, which the central bank utilizes to assess competition within the market. To capture the market share (*MS*) of the  $i^{th}$  bank, the study uses bank size (*SIZE*) measured as total bank assets scaled by total market assets. X-efficiency and scale efficiency are calculated using data enveloping (*DEA*) methods. The variables used in estimating the efficiency scores include labor costs, total assets, total deposits as inputs and total loans and income as key out-

puts. Various variables are used to capture bank specific control and risk variables. The study controlled for loans to assets ratios (*LTA*), loan loss reserves to gross loans (*LORG*), cost to income ratio (*CTI*) revenue concentration within each bank (*RevC*), deposit to total assets (*DTA*), total risk exposure (*TRE*), and total equity (*TE*).

The descriptive statistics indicate positive skewness for *HHI*, *SIZE*, *XEFF* and *TE*, which have means closer to the maximum values. This could reflect the influence of the four big banks controlling majority of the market. *HHI* value above .18 is considered very highly concentrated (Mishi & Tsegaye, 2012) and the mean is very close to that. The other variables have means closer to the minimum implying negative skewness.

#### 4.2. Results

This paper is set out to investigate the relationship between performance and market structure in the banking sector in South Africa. To understand this relationship, equation (2) is estimated and the results are shown in Table 1. Three separate equations are estimated for the three different measures of performance.

The diagnostic tests indicate that the model is well specified. The null hypothesis for the Sargan – Hansen test shows that the over identifying restrictions are valid. Further, the Arellano – Bond test for first- and second-order autocorrelation in the first-differenced errors, and the null indicates no autocorrelation.

**Table 2.** GMM estimation results

| Variables     | ROA                  | ROE                   | NIM                  |
|---------------|----------------------|-----------------------|----------------------|
| HHI           | 101.06***<br>(19.70) | 204.3**<br>(114.1)    | 443.8<br>(423.1)     |
| SIZE          | -4.023**<br>(1.103)  | 1.668<br>(2.701)      | -47.12***<br>(12.34) |
| LTA           | 1.109**<br>(0.061)   | 8.079***<br>(0.084)   | -15.83<br>(11.10)    |
| LORG          | 0.152<br>(0.270)     | 0.022*<br>(0.006)     | 0.309<br>(0.919)     |
| CTI           | -0.976***<br>(0.050) | -0.607**<br>(0.070)   | 0.341**<br>(0.028)   |
| RevC          | 1.910**<br>(0.791)   | 10.00**<br>(4.03)     | 35.52<br>(22.06)     |
| DTA           | 4.980***<br>(1.081)  | 16.945***<br>(4.001)  | 13.051*<br>(5.70)    |
| XEFF          | 3.381<br>(1.962)     | -1.806*<br>(0.995)    | -7.089*<br>(2.003)   |
| SEFF          | 0.887***<br>(0.0530) | 0.169**<br>(0.0042)   | -0.04915<br>(0.1649) |
| TRE           | 1.663***<br>(0.093)  | 0.458<br>(1.333)      | -7.956***<br>(2.098) |
| TE            | 1.328<br>(0.570)     | -11.234***<br>(2.096) | 28.815**<br>(11.13)  |
| Observations  | 97                   | 97                    | 97                   |
| Number of BFI | 11                   | 11                    | 11                   |

Notes: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Robust standard errors are in parentheses.

#### 4.2.1. Hypotheses testing

The variables of interest are *HHI*, *SIZE*, *XEFF* and *SEFF*. In order for the four hypotheses discussed above to hold, the coefficients on all these variables must be positive. Additional conditions are required for the X-efficiency and scale efficiency hypotheses to hold unambiguously. This condition is discussed below. Table 4 summarizes the results for the four hypotheses being tested.

Table 4 shows that the traditional structure conduct and relative efficient hypotheses are supported. The coefficient on the concentration variable (*CONC*) is

positive, while the coefficient on the market share variable is negative. There is no support for the argument that banks with larger market shares and a product mix will be profitable despite concentration in the market. Therefore, the traditional *SCP* hypothesis dominates the relative market hypothesis; market power in the banking sector in South Africa is driven by bank concentration.

The efficient market hypothesis is not fully supported. The *XEFF* coefficient is significant in two equations (*ROE* and *NIM*) and not significant in the *ROA* equation. Where it is significant, it does not have the expected sign. Although this sign does not support the hypothesis, it can be correct-

**Table 3.** The diagnostic tests

| Test                 | Diagnostic tests    |                     |                     |
|----------------------|---------------------|---------------------|---------------------|
|                      | ROA                 | ROE                 | NIM                 |
| Arellano – Bond test | Pr > z = 0.667      | Pr > z = 0.485      | Pr > z = 0.470      |
| Sargan – Hansen test | Prob > chi2 = 0.933 | Prob > chi2 = 0.905 | Prob > chi2 = 1.000 |



**Table 4.** Hypotheses testing

| Hypothesis                               | A priori expectation         | Outcome  | Conclusion  |
|--|------------------------------|--|---|
| Traditional structure conduct hypothesis | H0: $\alpha_1 > 0$<br>(CR)   | + ROA<br>H0: $\alpha_1 > 0$<br>+ ROE<br>H0: $\alpha_1 > 0$ | The hypothesis is supported. Collusive behavior of dominant banks influences the price setting process and, therefore, allows these banks to gain superior profits over other banks in the industry |
| Relative market hypothesis               | H0: $\alpha_2 > 0$<br>(MS)   | –ROA<br>H0: $\alpha_2 < 0$<br>–NIM<br>H0: $\alpha_2 < 0$   | Firms with a higher share power and more differentiated products are less profitable than the ones with lower market power. The hypothesis is not supported   |
| The relative X efficiency hypothesis     | H0: $\alpha_3 > 0$<br>(XEFF) | –NIM/ROE<br>H0: $\alpha_3 < 0$                             | Firms which have more X-efficiency advantages such as managerial capacities have lower interest margins. The hypothesis is not supported  |
| The relative scale efficiency hypothesis | H0: $\alpha_4 > 0$<br>(SEFF) | +ROA<br>H0: $\alpha_4 > 0$<br>+ROE<br>H0: $\alpha_4 > 0$   | Banks producing output at levels that are closer to the minimum efficient scale or average cost achieve greater efficiency which leads to higher profits. The hypothesis is accepted <sup>7</sup>   |

ly interpreted to depict possible behavior in the industry. Banks with larger market shares could use their market share as leverage to retain customers by paying higher deposit rates, therefore, putting pressure on interest margins and returns on equity. This implicitly supports the *SCP* hypothesis. The scale efficiency hypothesis, however, is supported. *SEFF* is positive in both the *ROA* and *ROE* equations; banks operating at or closer to the minimum scale exhibit higher returns which is also intuitive.

Other control variables considered are loans to total assets (liquidity), loan loss reserve to total gross loans (credit risk), cost to income ratio (efficiency), revenue concentration (*HHIREV*) (diversification), deposit to total assets (funding), total risk and total equity. There is a positive and statistically significant relationship between liquidity and performance as measured by *ROA* as well as with *ROE*. A higher ratio of loans to total assets indicates that liquidity is low and the bank is exposed to higher default risk. The results reflect how vertiginous the South African banks are and willing to go in search of profits. The cost to income ratio indicates a bank's ability to convert its resources into revenue. The negative coefficients

on *CTI* support this assertion when performance is measured by *ROA* and *ROE*. The coefficient in the *NIM* equation is negative suggesting that cost efficiency deteriorates as *NIM* increases. Losses resulting from inefficiencies may invariably be covered by increasing the spread between lending and borrowing rates so that the cost of inefficiency is borne by the bank's customers.

The revenue mix variable (*RevC*) has a positive effect on returns to both assets and equity. Banks with different revenue streams show better performance as expected. *RevC* has no effect on *NIM*. *DTA* is positively and significantly related to both *ROA* and *ROE* but negatively related to *NIM*. On the one hand, banks that rely heavily on deposits for funding tend to be more profitable. On the other hand, heavy reliance on deposits for income reduces the interest margin. This could reflect pressure on interest rates paid to depositors as banks bid to attract more deposits. *TRE* is significant in the *ROA* and *NIM* equations. The positive sign in the *ROA* equation may reflect the positive effect of risky investments that payoff<sup>8</sup>. The negative sign in the *NIM* indicates the dampening effect on interest margins as risk exposure increases.

7 To avoid ambiguity, efficiency must have a positive effect on market share. So that  $\beta_1, \beta_2, \theta_1, \theta_2$  are all positive in equations (3) and (4).

8 This variable is significant only at the 10% level in the *ROA* equation.

**Table 5.** Testing for necessary conditions

| Variables       | CONC       | MS        |
|-----------------|------------|-----------|
| CTI             | -.0203 *** | 0.012*    |
| GSD             | -0.013***  | -0.001**  |
| FEntry          | -0.109***  | 0.167***  |
| XEFF            | 0.170**    | -0.613*** |
| SEFF            | 0.016***   | -0.014    |
| inflation       | -0.120***  |           |
| GDP             | -0.103***  |           |
| Constant        | 102.01***  | 7.220***  |
| Observations    | 118        | 140       |
| Number of banks | 11         | 11        |

Note: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

#### 4.2.2. Tests on the efficient market hypothesis

The estimation of equation (2) suggested that the relative scale hypothesis holds. For the efficient structure hypotheses to hold unambiguously, the efficiency variables should have a positive effect on performance. The condition is satisfied if the coefficients  $\beta_1$ ,  $\beta_2$ ,  $\theta_1$  and  $\theta_2$  are positive in equations (3) and (4). In the two equations, *CONC*, *MS*, *SEFF* and *XEFF* are as defined before.  $Z_i$  represents control variables. These include *CTI* as defined before, the share of foreign bank assets (*FE*) and the growth of sector deposits (*GSD*). Some macroeconomic variables are also included as per Demirgüç-Kunt et al. (2004) and González (2009). The macroeconomic variables include the inflation rate and GDP. The estimation results are shown in Table 5.

$$CONC_k = \beta_0 + \beta_1 XEFF_i + \beta_2 SEFF_i + \beta_3 \sum_{i=1}^n \phi_i Z_i + \varepsilon_i. \quad (3)$$

$$MS_k = \theta_0 + \theta_1 XEFF_i + \theta_2 SEFF_i + \theta_3 \sum_{i=1}^n \phi_i Z_i + \varepsilon_i. \quad (4)$$

Both variables of interest are significant and positive in the concentration equation. *SEFF* is insignificant in the *MS* equation, while *XEFF* is significant but negative. The *CONC* equation, therefore, lends some support for the efficient market hypothesis. Both scale and X-efficiency lead to increased concentration in the banking sector. The negative effect of *XEFF* in the *MS* equation suggest that the efficient market hypothesis only holds weakly. The results from estimating equation (2) are, therefore, confirmed.

## CONCLUSION

The paper has investigated the profit-structure relationship in the South African banking sector. Using the discriminating test introduced by Berger (1995), the effect of market share concentration and efficiency on different measures of profitability has been checked. The results show that all these variables are significant to some degree. The concentration measures unequivocally support the traditional SCP hypothesis. The negative effect of market share indicates that the relative market power hypothesis is not supported. Further, the results do not support the relative market efficiency hypothesis. This variable is only significant in the net margin equation and has a negative sign. The results, however, support the assertion that banks producing at or close the minimum efficient scale have higher returns. Therefore, scale efficiency hypothesis is supported. An auxiliary regression to ensure that the results of the efficient market hypothesis are not spurious was estimated and tested based on

Berger (1995). The results lend partial support for the efficient market hypothesis in the concentration equation. The e-efficiency variable is significant in the market share question but is negative. The conclusion is that the structure conduct performance hypothesis dominates the profit-structure relationship in the South African banking sector.

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