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The relationship between market structure and deposit pricing: an empirical study of the local banking market

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Abstract

According to Bresnahan¹ (1989, p. 1012), “firm and industry conduct are viewed as unknown parameters to be estimated. The behavioural equations by which firms set price and quantity will be estimated, and parameters of those equations can be directly linked to analytical notions of firm and industry conduct”.

We formulate a single equation model of bank deposit pricing behaviour under oligopoly using the methodological and conceptual guidelines of the existing studies in the literature review to determine local bank deposit pricing.

The study reports a small but statistically significant influence of market structure on interest rates paid on savings deposits. Generally, these results confirm the a priori theoretical predictions of the structure-conduct-performance (SCP) hypothesis regarding the perceived relationship between market concentration (market power) and firm conduct (pricing).

The study explicitly controls for alternative sources of competitive bank funding by including the interbank lending rate as a regressor.

Efficiency considerations under oligopoly have implications for social welfare and the paper attempts to make inferences regarding the economic welfare of depositors under this imperfect but realistic market structure. The outcomes have certain ramifications in terms of competition policy.

¹ Bresnahan T. F. in Schmalensee and Willig, Handbook of Industrial Organisation Volume II, 1989

LIST OF ACRONYMS AND ABBREVIATIONS

ABSA	Amalgamated Banks of South Africa Limited
BP	Basis point
CMA	Common Monetary Area
CR4	Four-firm concentration ratio
DW	Durbin-Watson
FNB	First National Bank Limited
GDP	Gross domestic product
HHI	Hirschman-Herfindahl index
JIBAR	Johannesburg Interbank Lending Rate
NEIO	New Empirical Industrial Organisation
NIO	New Industrial Organisation
OLS	Ordinary least squares
PTSCS	Pooled time series cross-section
REPO	Repurchase rate
ROA	Return on assets
ROE	Return on equity
SARB	South African Reserve Bank
SBSA	Standard Bank of South Africa Limited
SCP	Structure-conduct-performance
SUR	Seemingly unrelated regression
US	United States of America

1. INTRODUCTION

According to the structure-conduct-performance (SCP) hypothesis, the degree of concentration of a market exerts a direct influence on the degree of competition amongst its firms. Market concentration refers to the number of firms in an industry and their size and market share distribution. The hypothesis posits that in a highly concentrated market one is likely to experience reduced competition and greater collusion amongst the larger firms. The SCP framework is telling us that highly concentrated markets confer market power on firms in that market, allowing these firms to raise price above marginal costs consistently and profitably above competitive levels. The outcome of this is increased profits because of greater control over price setting.

This paper is aimed at determining the nature of the relationship between market concentration and pricing of consumer deposits in the South African bank consumer deposits market. Okeahalam (1999) established that a negative relationship exists between deposit instrument rates and market concentration in the local banking market. The results of this research will serve to discount the contention that short-term disequilibria could be a reason for the finding of negative relationships in price-concentration studies like those performed by Okeahalam.

The theoretical underpinning of the research is the assumed causal relationship between industry structure, firm conduct and market performance of the structure-conduct-performance (SCP) framework. However, it should be pointed out that this so-called 'structuralist approach' is challenged by the Chicago School argument that firm efficiencies can be shown to account for the concentrated market structures.

The view of authors like Fourie and Smith (1998, 1999) is that the debate is essentially gridlocked between these competing schools of thought. These are

based on complex technical, methodological and ideological differences that are embedded in the philosophy of science and the evolution of economics (and industrial economics) in its effort to generate a conclusive set of answers regarding the concentration-profit issue. The latter views can be regarded as qualifiers in the interpretation of results and the direction of causality.

This study has at its foundation the theory of imperfectly competitive markets (i.e. oligopoly theory), and uses the intra-industry econometric methodology employing formal models of firm conduct. The paper starts by examining the institutional structure of the South African consumer deposits market in Section 2 as background to the empirical work. This is followed by a review and critique of the literature on the SCP framework, its applications, and challenges in Section 3. The methodology and data are discussed under Section 4, the empirical analysis and findings under Section 5. Section 6 summarises and concludes our analysis.

2. THE INSTITUTIONAL STRUCTURE OF SOUTH AFRICAN BANKING

2.1 Market structure characteristics

Market structure characteristics refer to the number of competitors in the market, their size and market share distributions. Also of importance is the type of product sold in the market and whether firms exercise control over the price of the relevant product. Barriers to entry are a further characteristic of markets to the extent to which it is difficult or easy for new firms to enter a market for a product or service. Market structures also differ in terms of the degree that firms compete with each other on the basis of non-price factors such as product features and advertising.

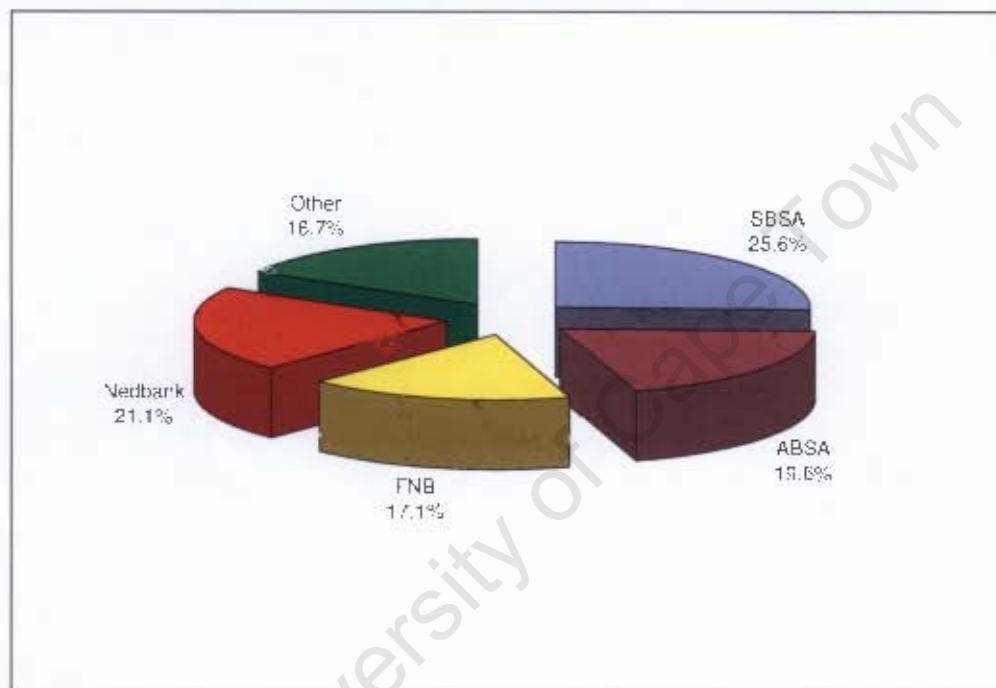
Competition is not just a neutral means to other ends. Shepherd (1997, p. 135) states that “competition provides value in itself, even beyond the effort, efficiency, innovation, and fairness that it promotes”. The author also points out the limits of competition and the potential harm it may impose.

Oligopoly represents a market in which a few firms produce the bulk of output in a market with a few competitive firms representing the fringe. The total number of competitors in the South African banking market has averaged 38 over the period between 1994 and 2002. A greater number of competitors do not necessarily translate into greater competition especially in the event that economies of scale are relevant in the market under analysis. In terms of size, the so-called Big 4² banks controlled 83.3% of total bank assets at January 2005 resulting in a four-firm concentration ratio in terms of total assets of 83.0%. This implies a highly oligopolistic market that could potentially allow banks scope over price setting and control.

² The Big 4 banks are the Standard, ABSA, Nedcor, and Firststrand groups respectively

The distribution of percentage total asset shares is shown in the following figure. The percentage control over assets by the Big Four is more than double the thumb rule of 40.0% control bestowing oligopoly power on the four large firms inferred by McConnell and Brue (2002: p. 494).

Figure 1 Bank total assets as a measure of bank market share



Source: SARB DI900 returns, own calculations

A standard theoretical prediction regarding the presence of economic profits is its attraction of potential entrants thus competing away profits unless sustained barriers to entry and incumbents' strategies prevent it. However, it should be noted that regulatory capitalisation requirements through government regulation pose problems for quick entry and exit strategies particularly in banking.

In terms of the Banks Act it used to be required of foreign banks to take R1 million as the minimum deposit from individuals, effectively barring these banks from competing in the market for consumer deposits. This requirement has however been abolished (Competition Commission, 2001, p. 5). Risk

considerations to the stability of the broader financial system and the economy are mitigating factors generally and make the banking industry a highly regulated market in terms of licensing and operation requirements. Furthermore, entry deterrence by incumbent banks could be putting paid to greater entry whereby incumbents modify their strategic behaviour to deter entry by potential entrants.

2.2 Bank pricing behaviour under oligopoly

The Task Group on Competition in South African Banking was charged with investigating competition in the South African banking industry. According to the report (2004), commissioned by the National Treasury and the South African Reserve Bank (SARB) respectively, the leading banks' ability to maintain stable profit rates (return on equity), over the business cycle leaves much to be desired.

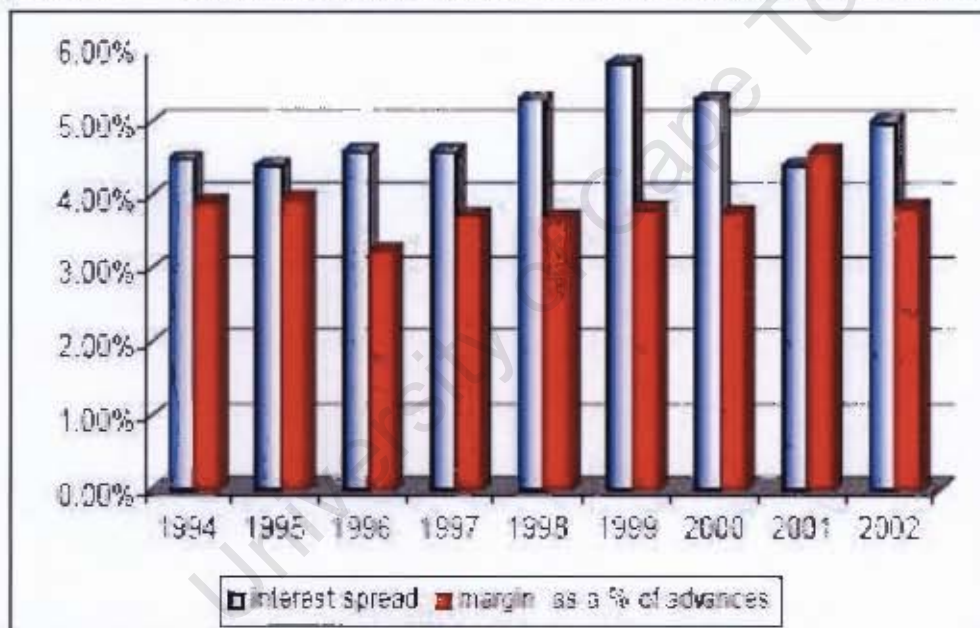
Economic theory suggests that firms under oligopoly and monopolistic competition market structures have some control over the price of the product they sell. "The market power of an individual bank increases with the degree of monopoly in its market and by its size relative to the market. The greater is its market share, or the more concentrated is the market, the greater will be its control over its price and the services it offers" (Heggstad and Mingo, p.110).

Banks in the local banking market have maintained a stable interest rate margin for a considerable period of time i.e. since the early 1990s. An increased interest spread may reflect market power to extract a higher margin. The interest spread is defined as interest income less interest expenses (Falkena et. al., p. 23). In order to establish the degree of price control in the banking market we track the interest margin as a percentage of the value of advances. We then compare this with a measure for market concentration and if a close correlation is established, *ceteris paribus*, it lends support to our alternative (maintained) hypothesis that the relationship between market structure and consumer deposit rates is

statistically significant. More specifically, there exists a negative relationship between market structure and the rates paid on consumer deposits.

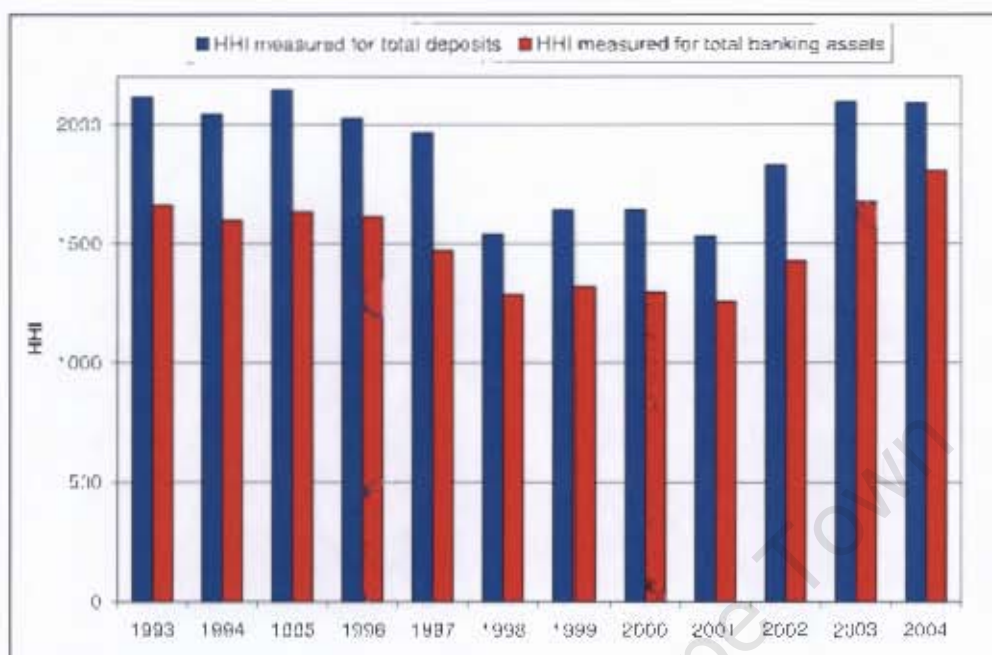
A similar pattern in terms of market power (interest margin as a % of advances) is observed if one were to superimpose the latter diagram onto Figure 3. Market power (interest margin) is high in the earlier periods 1994-95 and declines in tandem with the HHI from 1997-2000. Thereafter we see a rise in margin as a percent of advances when the HHI starts increasing again to pre-1998 levels.

Figure 2 Interest rate spread and interest margin: South African banks



Source: Competition in Banking Report

Figure 3 Market concentration in terms of HHI



Source: SARB DI900 returns, own calculations

The characterisation of the local banking market as oligopolistic and that this gives rise to market power implies that we have to confront the theory with data and test this assertion. The testable implication for pricing behaviour by South African banks suggests that conduct (setting the prime rate, deposit rates, or the interest margin) is possibly related to market structure. Market structure, having been characterised as oligopolistic, and the inferences regarding pricing practices following from oligopolistic market structures in terms of the SCP framework, are tested in this paper.

The study employs pooled time series cross-section (PTSCS) data from the local banking industry. The study by Okeahalam employed monthly observations over the period 1997-99, which renders it susceptible to the criticism by the Chicago School about the relationships reflecting short-run disequilibria. Our observations are over quarterly intervals starting from 1993 to 2002.

3. EMPIRICAL LITERATURE REVIEW

3.1 Price-concentration vs profit-concentration

Structure-conduct-performance (SCP) studies can generally be divided into two groups according to the measure of performance (or conduct) employed. The first group uses some measure of the price of certain banking products and services in order to capture the performance of a firm, while the second group uses some kind of profitability measure, such as return on assets (ROA) or return on equity (ROE).

Profit-concentration studies are however extensively plagued by measurement and interpretation problems, this is because profits include both prices and costs in their measure. Therefore, the findings of statistically significant causal relationships between market structure and profitability could either be explained by market power reflected by pricing behaviour (increased prices) and/or superior efficiency (lower costs). The residual of prices and costs which in banking pricing studies represents the interest margin, can also be employed as regressand to test the paradigm.

Price-concentration studies on the other hand are widely thought to overcome these problems because prices are not subject to the many accounting conventions that generally complicate studying profits. These studies explain pricing behaviour and exclude superior efficiency and thus the efficient structure hypothesis as an explanation. However, according to Brewer and Jackson (2004, p. 1) the omission of firm-specific variables which may systematically affect the cost or demand for deposits could be problematic.

The separation of possible determinants of bank performance through the price-concentration approach leaves much to be desired as well. According to Evanoff and Fortier (1988, p. 281), "prices can be utilised only if costs are explicitly

accounted for as an explanatory variable". Clearly, what the price-concentration theorists have been leveling as a criticism at profit-concentration studies has not been resolved since most studies hardly account for the costs of multi-product and thus multi-cost industries like banking.

Heggstad and Mingo (1976, p.107) contend that by considering only one price for multi-product firms like banks, price-concentration studies may well be underestimating the total impact of market power on bank performance. These authors hold the view that non-price competition may be as important as price competition or that non-price dimensions may best be reflecting competition in the banking market because regulation and tradition within the banking industry work toward the substitution of non-price for price competition (*ibid*). Non-price competition can be in the form of advertising spending and research and development or technology spending. However, non-price competition is very difficult to control for in studies on the determinants of market performance.

An examination of the main strands in the literature³ and the evolution thereof shows that the SCP paradigm was the dominant paradigm in industrial organisation from 1950 until the 1970s. The 1960s witnessed many broad cross-section econometric studies⁴ that tried to establish a relationship between some measure of market structure and firm behaviour or market performance. This continued through the period 1970-1990 and up to the present in the form of the New Empirical Industrial Organisation (NEIO) industry-specific studies.

New industrial organisation (NIO) theory developed from the theoretical models of game theory. This rigorous theoretical modelling of market conduct placed less emphasis on empirical testing (Fourie and Smit, 1998). According to Shepherd (1997, p. 29), "although game theory models are rigorous, they often have limited relevance for real competitive processes in real markets". On the other hand,

³ This section is based on the discussion in William G. Shepherd (1997)

⁴ This include studies by Weiss, Scherer, Comanor, Wilson and Shepherd amongst others

Bagwell and Wolinsky (2000), in a general assessment of the contribution of game theory to the field of industrial organisation contend that important developments in game theory generated new insights to the substance of industrial organisation. The authors are of the view that “many of the insights offer a better qualitative understanding of important aspects of actual market behaviour” (*ibid*, p.41).

Furthermore, “cautioning against conclusions that the game theoretic approach provides consistently superior quantitative predictions, they believe that the framework has enabled regulators to think more thoroughly about the consequences of a merger”. It must therefore be considered that game theoretic models complement the policy analyst’s toolkit of models available in evaluating market structure characteristics on firm conduct and performance and the possible effects of proposed mergers on competition on industry sectors and the economy as a whole.

The New-Chicago school analysis is essentially a defence of the efficient-structure hypothesis and a positive analysis of monopoly or concentrated market structures. The efficient structure hypothesis states that greater efficiency gives rise to greater market shares for the more efficient firms and that high market concentrations is the outcome observed for more efficient industries.

Contestability theory emerged during 1975 to 1982 and focused on free entry arguing that entry conditions mattered more than existing monopoly. This literature challenges the methodology and conclusions of the SCP framework and the contention is that the feature of markets like barriers to entry determines performance and market structure is not an independent determinant of competition (Gilbert, 1984, p. 628). Contestability theory is premised on the concept of free entry and exit by potential entrants, probably lured by the presence of economic profits in an industry.

Baumol (1982, p. 2), one of the pioneers in the field, contends that “the analysis provides a generalisation of the concept of the perfectly competitive market and is generally characterised by optimal behaviour and yet applies to the full range of industry structures including even monopoly and oligopoly”. To the extent that real world markets approximate the perfectly contestable market model and is explained by the theory implies that it will make for a very compelling model. According to Baumol, “perfect contestability serves as a benchmark for desirable industrial organisation which is far more flexible and far more widely applicable than the one currently available”. The defining characteristic of a perfectly contestable market “is one in which entry is absolutely free and exit absolutely costless” (*ibid*, p. 3).

However, according to Shepherd (1995, p.302) there are “three highly restrictive assumptions” underlying this theory by Baumol and colleagues, these are:

- Entry is free, without limit. This implies that any entrant induced to enter, can instantly duplicate and entirely replace any existing firm, even a complete monopolist.
- Entry is absolute to the extent that the entrant can establish itself before an existing firm makes any price response.
- Entry is perfectly reversible – exit is perfectly free, at no sacrifice of any cost. Sunk costs are strictly zero.

Clearly these assumptions are very restrictive and can hardly hold up in reality. Shepherd pointed out the mutual inconsistency in the first two assumptions in that “entry cannot be both trivial and total”. This is true to the extent that if entry is trivial, then it has no force. On the other hand if entry is total, the incumbent(s) will respond to protect their turf and profits (*ibid*). There appears to be a discounting of entry barriers as reflected in the assumptions and this distorts reality.

The contention by Baumol on the flexibility of the model does not seem to be realistic in light of the criticisms leveled by Shepherd. However, as much as game theory generated new insights to the substance of industrial organisation, the contribution made by contestability theory should not be discounted either notwithstanding the limitations of the assumptions.

The SCP framework is still used extensively in competition analysis in sectors and industries in many countries to determine whether firm mergers and acquisitions are in the public interest and the economy. Therefore, the SCP paradigm is still highly relevant for its less restrictive assumptions and practicable approach and being grounded in the economic theory of market structure.

3.2 Critique of empirical tests of the SCP hypothesis

However, the SCP framework is plagued by weaknesses that give rise to challenges relating broadly to causality and interpretation, methodological approaches and the ideological beliefs of the different schools of thought. At a fundamental level the criticism of the SCP hypothesis, to paraphrase Fourie and Smith (1999, p. 37) “was growing unease at the lack of theoretical rigour that had characterised much of the SCP programme. There was a sense that many of the specification problems were caused by models being based more on informal inference than formal derivation of the hypotheses from first principles”. As a result, the numerous studies conducted to determine the relationship between market structure and firm performance did not shed much light on the nature of the assumed relationships. The SCP framework was also challenged due to both measurement and conceptual (causality and interpretation) issues.

There is however a strong theoretical basis for the use of the SCP framework according to Heggstad (1984, p.646). “Increases in concentration, *ceteris paribus*, increase the ability of firms in the market to achieve and maintain the profit-maximising monopoly price. Consequently, as the structure of a market

approaches monopoly, performance diverges from the competitive norm. Prices and profits increase. Firms become less sensitive to market forces.” The author contends that this “collusive cartel model is well grounded in economic theory”, the contestable markets model is also a compelling alternative explanation of the relationship between market structure and firm performance.

3.3 Conceptual, measurement and interpretation issues

Here follows a treatment of the different issues that still plague studies of the SCP framework.

Gilbert (1984, p. 629) contends that “greater weight should be given to the results of those equations with the fewest measurement and conceptual problems when forming an overall impression about results”. This is because results of bank market structure studies do not consistently support or reject the maintained hypothesis that market concentration influences bank performance.

Technical issues relating to measurement problems, interpretation and direction of causality in the interrelationships between economic variables are very important. Measurement problems relate to the appropriateness of the validity of using measurements of profitability to infer market power (Church and Ware, p. 432). Because market power is usually measured by relative markup of price above marginal cost ($P - MC > 0$), a better measure would have been the Lerner index which measures the relative markup of price over marginal costs. The Lerner index (L) is defined as:

$$L = \frac{P - MC}{P}$$

This index requires information on marginal costs of production which is not readily observable, price-concentration relationships are not plagued by this

problem. This critique does not have a direct bearing on our study. This is because we do not employ profitability data since the study is not attempting to establish a direct relationship between concentration and profitability. The problem is circumvented because we follow the direct estimation of market conduct approach.

“The other measurement problem associated with SCP studies is market definition. While there is considerable agreement on the latter there is less consensus on the implication of inappropriate market definition for the validity of the estimations on the effect of concentration on market power” (*ibid*, pp. 432-438). It should be noted however that this study focuses on a product market with clear geographic dimensions and well-defined measure of so-called market power, namely deposit prices.

Conceptual criticisms of the SCP hypothesis relate to the interpretation of results amongst others, e.g. whether empirical tests of the SCP represent long run or short run relationships. It is not necessarily the case that firms and/or industries in cross-sectional estimations are in long term equilibrium (*ibid*). Because “any profitability measure implies a corresponding difference between price and average cost, a causal relationship running from concentration to profitability can either operate through an effect on price (the usual interpretation), or on average cost, or, of course both” (Peltzman, p. 229). This implies that interpretation is unclear in profitability-concentration relationships, and so is the nature of the assumed causality. It therefore raises the question of the assumed exogeneity of the market concentration variable; as a result, one can pose the question whether it is not conduct that affects market structure?

Berger and Hannan (1989) in a study of the price-concentration relationship in the US banking market found strong support for the SCP paradigm. They tested a specification in which some measure of market concentration is exogenous and a determinant of some rate paid on retail deposits. The interest rate is measured

in basis points and concentration ratio in percentage points; they also used both the Hirschman-Herfindahl Index and three-firm concentration (CR3) ratio respectively as proxies for market structure. The estimations were performed using ordinary least squares (OLS). It is a joint hypothesis test of the SCP and efficiency-structure hypothesis which rejects the null hypothesis of market concentration having no effect on bank behaviour regarding deposit rates paid that reduce consumer welfare.

However, Jackson III (1992) in a comment on the findings by Berger and Hannan questioned the results of their study. He questions “whether the negative price-concentration relationship is consistent over the full range of observed values of market concentration”. The latter concerns possible (mis) specification of the true price concentration relationship. Also, according to Heggstad and Mingo (1976, p. 110), “economic theory does not indicate the appropriate functional form for the relationship between market structure and performance”. It therefore follows that misspecification of the true relationship between prices and concentration in banking will raise a challenge to the validity of the results and thus for the SCP as a framework for developing bank regulatory policy.

In their findings of a statistically significant relationship between market concentration and prices or services for household customers in commercial banking and notwithstanding their foregoing comments, Heggstad and Mingo contend that the linear form is one of the best performing functional forms in terms of the *t*-ratios and *F*-statistics (*ibid*, p.111). Edwards (1964) similarly found a statistically significant relationship between market concentration and business loan rates and the level and flexibility of loan rates. His findings are that loan rates are higher in highly concentrated markets than in less concentrated markets and also that these rates are less flexible in relatively concentrated markets (*ibid*, p.300). Loans are the converse of deposits and these findings are generally in line with what one would expect in terms of the SCP paradigm.

3.4 Ideological issues

Ideological beliefs rooted in the efficacy of the market and the role and purpose of the state that have dogged schools of thought for ages also characterise the debate (*ibid*, p. 33). Some theorists (Chicago School) question the validity of the SCP hypothesis on the basis of 'market discipline' rendering the prevalence of economic profits not feasible in the long run. Imperfect markets, the conception thereof and the consequences arising from that are at the heart of the matter. The argument is that economic profits attract potential entrants, these entrants then "discipline" incumbents by charging less or offering higher deposit rates. In the long run, therefore, economic profits are zero and competitiveness prevails. It should be noted, however, that structural barriers to entry and exit precludes this argument. It could be the case that abnormal profits are possible because of entry barriers (see Section 2.1 for a discussion).

A challenge to the interpretations and findings supporting the SCP paradigm⁵ is the efficient-structure hypothesis by Demsetz (1973) and Peltzman (1977) amongst others. Demsetz contends that efficient firms obtain greater market share based on both price (production) and non-price (marketing) dimensions. Concentrated market structures are therefore efficient market structures as a result of the competitive processes at play. Peltzman in principle supports this view especially regarding the relationship between profits and concentration. He concludes that an eclectic view is more consistent i.e. profitability could be an outcome of both market structure and efficiency but he leans more towards efficiency effects (*ibid*, p. 262). Brown (1982) also finds support for this view, with a positive statistically significant relationship found between profit rates for relatively larger banks and market concentration. There is an absence of this same relationship in the case of smaller banks (Gilbert, p.628).

⁵ Berger and Hannan, Heggstad and Mingo, Edwards, Lloyd-Willims et. al.

Okeahalam (2002, 2003) studied the local (South African) and common monetary area (CMA) banking markets to determine the relationship between market concentration and pricing of consumer deposits. The Okeahalam study also tests the conventional specification in a joint hypothesis formulation. Because pooled data was employed as in our tests, there is likely to be some correlation in the error terms which gives rise to biased estimates.

3.5 Summary of literature review findings

The relevance of these studies is that they inform this research to a great extent. However, it should be borne in mind that the challenges to the SCP raised here blight all these studies to some degree therefore the results obtained are subject to the critique. The research reviewed here should not be regarded as exhaustive since studies of relationships in the banking industry in particular are numerous in the US market.

The explanatory variables used are not all common to all studies and it raises the specification problem and thus the criticism regarding the lack of theoretical rigour. The main specification problems are those of commission (including irrelevant explanatory variables) and omission (omitting relevant variables). The functional form of the relationship has been questioned by amongst others Jackson III (1992) and Heggstad and Mingo (1976) and the possible specification problems emanating from that. Also, the nature of assumed causalities, that it is market structure influencing firm behaviour is a questionable proposition. The contention here is that firm conduct could equally determine firm market share and market structure respectively. Lastly, another view held by the so-called Chicago School is that the observed relationships could be a result of short run disequilibria and that high market shares could be a result of superior efficiencies.

A bank price-concentration relationship is formulated under the methodological guidelines of the existing studies in the empirical literature review. The studies by Berger and Hannan (1989) and Lloyd-Williams et. al. (1994) in particular are used as benchmarks to expose the existing views on the price-concentration relationship for the purpose of basing the model by outlining the conceptual framework and to facilitate the interpretation of the findings of this empirical investigation.

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4. METHODOLOGY AND DATA

4.1 Model specification and testable hypothesis

In the empirical study, we pool data for different bank-specific and industry-wide variables respectively for local banks between 1993 and 2002. The SCP hypothesis can be tested by estimating the following reduced form following Berger and Hannan (1989):

$$y_{it} = dx_t + b'Z + e_{it} \quad (1)$$

Where y_{it} is the rate paid by bank i at time t on negotiable deposit instruments within banks i 's geographic market; x_t measures market concentration in the industry at time t , Z is a vector of controls, and e_{it} a random error term. The equation says that *ceteris paribus*, the rate paid on deposits by banks offering deposit instruments, is a function of the market concentration of total market retail deposits. It is also defined as a function of market per capita income, total bank assets, and the wage bill of the financial services sector as a proxy for cost. In order to take into consideration interbank funding as an alternative source of competitive cost funds, the interbank lending rate is included in the regression analysis⁶.

In this analysis, these firm-specific or market variables are the local financial services wage (WAGES), average per capita income (PCINC) in the local banking market, total assets controlled by each bank (TA), total growth of market deposits (DEPGRO), and the interbank lending rate (JIBAR) respectively. The following hypotheses are tested:

$$H_0: d = 0, H_1: d < 0$$

⁶ The interbank lending rate was included as regressor to account for the liquidity requirements of banks other than the SARB accommodation and therefore reflects the cost of alternative competitive sources of bank funding.

The null hypothesis (H_0) states that the effect of market concentration (x_t) is immaterial, in terms of statistical significance, to the rate that banks pay depositors. The alternative hypothesis (H_1) on the other hand states that greater market concentration gives rise to lower deposit rates all else equal.

“The independent variables reflect either the market demand for bank services or internal conditions that may be expected to influence the desire of the bank to compete for household deposits or loans” (Heggestad and Mingo, p. 110). Demand conditions in the market and the supply of deposit funds respectively are represented by per capita income as well as total market deposits growth. The greater is per capita income the higher will be the demand for (and the equilibrium price of) deposit instruments. The greater is market growth and thus the supply of deposit funds, the higher or lower could be the rate paid.

The following equation is estimated to test the hypothesis for the local banking industry:

$$y_{it} = \beta_0 + \beta_1 \text{CONC}_t + \beta_2 \text{PCINC}_t + \beta_3 \text{DEPGRO}_t + \beta_4 \text{TA}_{it} + \beta_5 \text{WAGES}_t \quad (2)$$

4.2 Methodological challenges

In the South African case there exist no local geographic markets for the banking industry that are demarcated in terms of legislation. For example, in the US, per capita income varies across states and so does growth of market deposits. Most importantly, the four-firm concentration ratios differ because they are determined for these local markets or statistical metropolitan areas (SMAs).

According to Lloyd-Williams et. al. (1994, p. 440) “this poses a problem for the researcher who wishes to study the SCP paradigm for individual countries because only one market concentration measure is available for any one period”.

An important point here is that the exogenous variable is quarterly time series data, the latter implies that there are no separate market concentration measures for different local geographic submarkets. Lloyd-Williams et. al., in a study on the Spanish banking sector encountered a similar problem in terms of a single banking market. The Spanish banking market is fairly similar to the South African banking market with a few commercial banks dominating retail banking followed by some savings banks. The so-called 'Big Seven' control over 80 percent of private bank assets (*ibid*, p. 434). The problem is countered by pooling the data i.e. estimating pooled time series cross-section regressions.

The study pools data from eight South African banks over the period 1993 from 2002 using both market-wide and firm-specific variables.

4.3 Data description and sources

This section discusses the data and sources utilised in the study and the caveats and complexities that plague these matters. The relevant product market for which data was sought was the retail/consumer deposits market. Quarterly observations of the interest rate paid on a number of deposit accounts held with commercial banks were obtained from financial publications for the first quarter of 1993 to the first quarter of 2002, giving 37 data points in total. Two different types of deposit account data were obtained for those banks that offered the product: the interest rate on 32 days notice deposit accounts and the twelve month fixed deposit instrument. Our sample includes banks which offered these types of accounts over the period under observation, there were eight banks which quoted rates for the 32 day notice deposits and 12 month fixed deposits account respectively.

In terms of the 32 days notice deposit account, the quoted interest rate applies to amounts in excess of R1000-00, the two different rates paid by the quoted banks is the dependent variable in our respective regressions.

Market structure is proxied by some measure of concentration, here the CR4 ratio and HHI respectively. It comprises of quarterly data on the four-firm concentration ratio (CR4) in terms of consumer deposits. The CR4 is a measure of the proportion of total consumer deposits held by the four largest firms relative to total market consumer deposits. The four largest banks in the country both by total asset value and total value of market deposits are the so-called Big Four which comprises ABSA, Standard Bank, FNB and Nedcor respectively. The CR4 averaged 80 percent of total market deposits and greater over the period.

A better measure of market concentration is the Hirschman-Herfindahl Index (HHI) used by competition authorities to decide on mergers and acquisitions and the effects these may have in terms of consumer welfare. According to Church and Ware (2000, p. 429) "concentration ratios do not adjust, as the HHI does, for variation in firm size". The HHI reflects both the distribution of the market shares of the top firms and the composition of the market outside the largest firms. In addition, the HHI has a strong point; it reflects market dominance appropriately with very high HHI values. The latter makes it particularly useful in competition analysis.

Table 1 Variable descriptions

Variable name	Description
ND32	32-day notice deposit instrument
FD12	12 month fixed deposit instrument
CR4	Four-firm concentration ratio
HHI	Hirschmann-Herfindahl Index
WAGES	Average monthly salaries and wages – financial services
PCINC	Local market per capita income
DEPGRO	Growth of total banking market deposits
TA	Bank total assets

Other explanatory variables that were found in previous tests to explain variability on interest paid are also included. These variables are total bank assets, the local financial services wage, bank market deposits, and market per capita income.

The data, including gross domestic product (GDP) and population estimates, were obtained from the SARB Quarterly Bulletin through *Time Series Explorer*®. The SARB Bank Supervision Department Banks' DI900 Returns is the source of information on total assets, deposits, and the derived concentration ratios.

Wages, per capita income, and market structure variable are quarterly series respectively because there is no geographic market or sub-market data.

4.4 Descriptive statistics and data transformations

Table 2 presents descriptive statistics on the variables employed in our analysis, it summarises a few key statistics for each variable. ND32 is the 32 day notice deposit account rates offered by banks for funds deposited with them on which notice of withdrawal can be given over a 32 day period. These funds can then be withdrawn after expiration of the notice period. FD12 refers to an account where a fixed amount of money equal to or exceeding a predetermined minimum amount, is held with the bank over a twelve month periods agreed to with the deposit-taking institution. The 32 day notice deposit account paid on average 11.36% between 1993 and 2001 whereas the fixed deposit accounts paid 12.1% on average over the period. The interest increases as the length of the deposit period increases. The average CR4 ratio is 80.45% over the period, implying that about four-fifths of bank retail deposits were held with the Big Four banks.

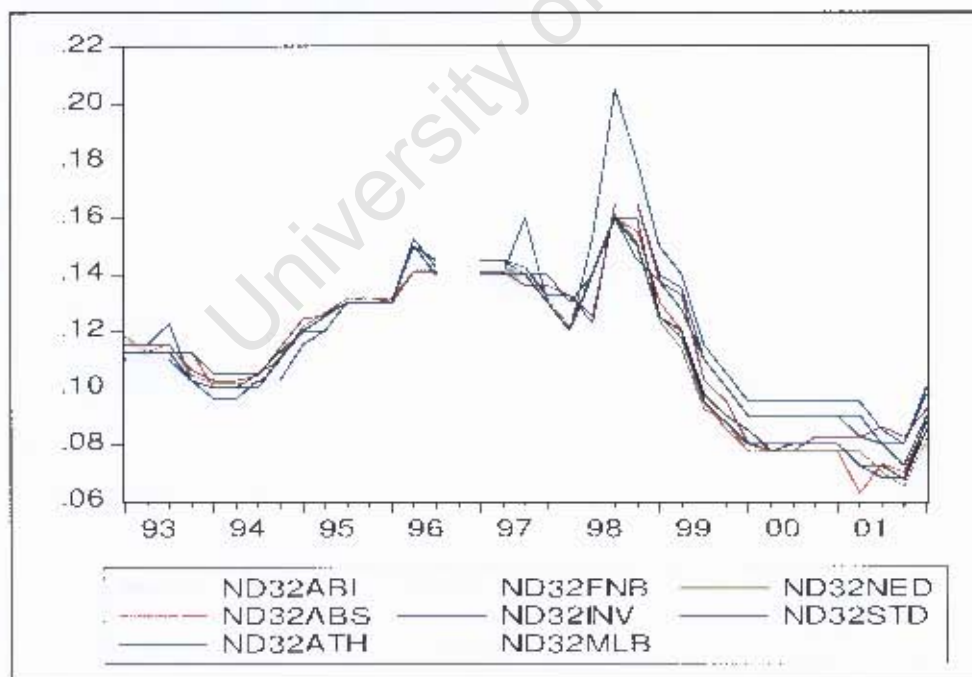
Table 2 **Summary statistics**

	ND32	FD12	TA	CR4	HHI	DEPGRO	PCINC	WAGES	JIBAR
Mean	0.114	0.121	5.89E+07	0.805	0.183	1.747	20831.0	6702.5	0.127
Median	0.113	0.120	5.08E+07	0.823	0.197	1.781	20895.7	5926.0	0.118
Maximum	0.205	0.180	2.10E+08	0.849	0.216	6.044	21505.0	10798.0	0.208
Minimum	0.063	0.067	3.56E+05	0.759	0.151	4.681	19486.1	4781.0	0.080
Standard deviation	0.026	0.023	5.83E+07	0.030	0.025	2.384	471.7	1771.9	0.033
Skewness	0.202	0.093	0.595	-0.211	-0.087	-0.624	-0.884	0.561	0.636
Kurtosis	2.446	2.011	2.166	1.362	1.182	3.289	3.471	1.970	2.536
Jarque-Bera Probability	5.036	10.85	22.62	30.62	35.73	2.463	35.85	3.575	2.829
Observation	257	257	257	257	257	257	257	257	257
Cross-sections	8	8	8	1	1	1	1	1	1

In terms of the SCP paradigm, this high concentration of deposits held by a few firms could result in them having greater control over prices, resulting in price-setting that is adverse to the consumer. Furthermore, mean market share is 10.7%, HHI 0.183 and the growth rate of market deposits 1.75% over the period. Statistics such as the mean value of all observations, median, standard deviation and the normality of distribution of the data, are reported in Table 2.

Figure 4 is a graphical depiction of the movement of interest rates paid by banks on a particular deposit account on deposit funds for the period between 1993Q1 and 2002Q1. The peak observed between 1998 and 1999 ranging between 16.0 and 20.0 percent can be attributed to the relatively higher money market interest rates as a result of the Asian currency crisis that hit quite a few developing countries.

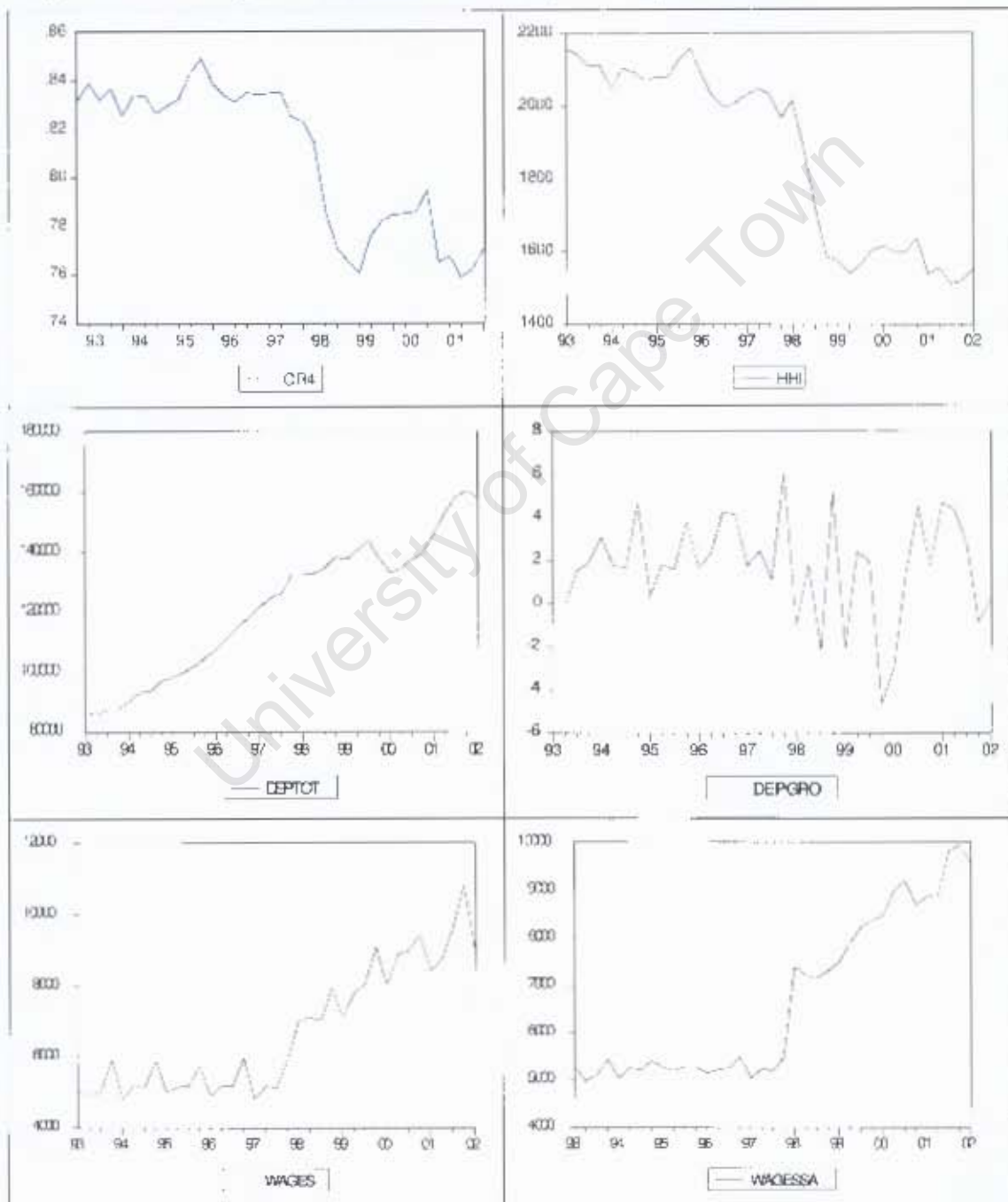
Figure 4 Bank 32 day notice deposit rates



In the different panes of Figure 5 are the time series of the structure variables (CR4 and HHI), total market deposits (DEPTOT), growth in total market deposits

(DEPGRO), and wages (WAGES) respectively. The variable WAGES is highly seasonal and following seasonal adjustment, the last pane of Figure 5 (WAGESSA) depicts the seasonally adjusted series.

Figure 5 Exogenous variables and explanatory variables



5. EMPIRICAL ANALYSIS AND DISCUSSION

5.1 Estimation and results

We performed relatively simple common coefficient tests for the pooled time-series cross-section estimations using the OLS regression technique, these tests disregard the time and space dimensions of the data (Gujarati, 2003). We assume constant coefficients across both time and units and that the intercept does not vary either. This interpretation clearly ignores the specific nature of each firm and is thus a very naïve and simple approach to this complicated data design. However, given the highly restrictive assumptions that assume that the slope coefficients of the independent variables are identical for all units, we still make qualified inferences as per the usual interpretation of such regression output in individual time-series or cross-sectional designs. The analysis was done using *Eviews 5.0*® statistical software package.

The critical values for deciding whether to reject or accept the null hypothesis is based on the 95% confidence interval t-statistics critical value ($t_{crit} > 1.96$). This implies that the statistic is in the rejection region if it exceeds the critical value, a t-statistic smaller than this critical value implies that we fail to reject the null hypothesis that the coefficient is statistically insignificant. “A statistic is said to be statistically significant if the value of the test statistic lies in the critical region, in which case the null hypothesis is rejected” (*ibid*, p. 131). When we reject the null hypothesis it implies that our finding is statistically significant.

Based on our strong a priori or theoretical expectation grounded in the SCP paradigm, we suspect that the deposit rate paid by banks should be declining due to market structure effects. This implies a so-called one-sided alternative hypothesis, as a result, our coefficient estimates are evaluated by one-tail tests in statistical terminology.

5.2 Regression diagnostic tests

The two main diagnostic tests that were performed were for serial correlation of the error term (autocorrelation) and heteroskedasticity respectively. Estimators based on regression plagued by these problems are inefficient in the class of such estimators (*ibid.*, p. 442). According to Gujarati (p. 442), "autocorrelation may be defined as correlation between the members of a series of observations ordered in time (as in time series data) or space (as in cross-sectional data). In the regression context, the classical linear regression model assumes that such autocorrelation does not exist in the error terms". Verbeek (2004, p.97) states that "autocorrelation normally occurs only when using time series data".

Heteroskedasticity is when the error terms appearing in the population regression function have unequal variances meaning that these error terms are mutually uncorrelated. "This problem is frequently encountered in cross-sectional models" (*ibid.* pp. 82-83).

We used the Durbin-Watson (DW) statistic of the regression output to test for the presence of autocorrelation using the critical values to determine whether positive or negative autocorrelation exists. The Durbin-Watson tests, based on the DW statistic of the regression, point to the presence of positive autocorrelation of the error terms based on the following decision criteria:

Table 3 Durbin-Watson d test: Decision rules

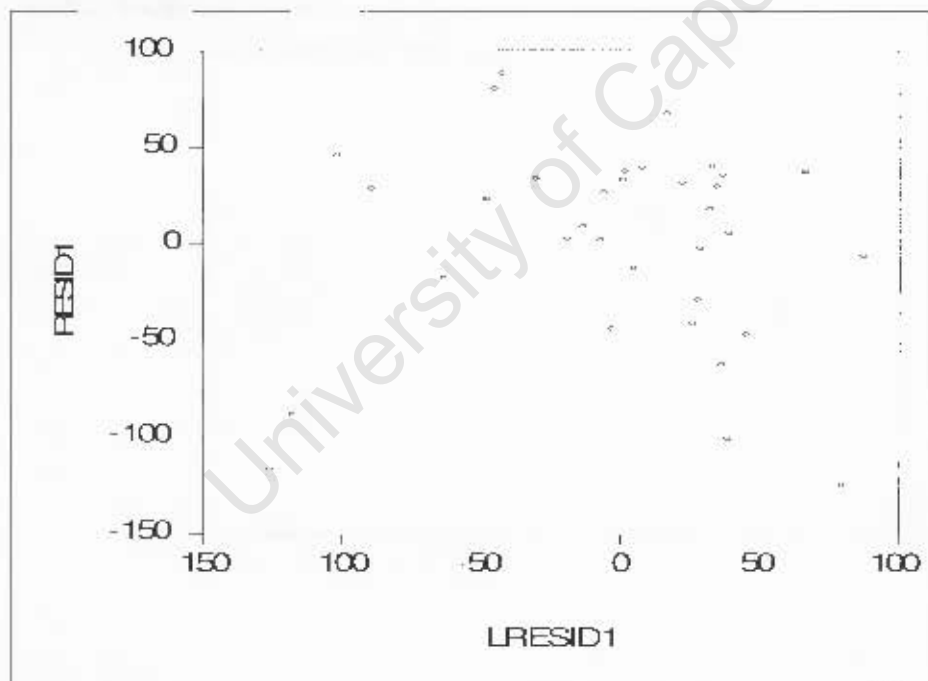
Null hypothesis	Decision	If
No positive autocorrelation	Reject	$0 < d < d_L$
No positive autocorrelation	No decision	$d_L \leq d \leq d_U$
No negative autocorrelation	Reject	$4 - d_L < d < 4$
No negative autocorrelation	No decision	$4 - d_U \leq d \leq 4 - d_L$
No autocorrelation, positive or negative	Do not reject	$d_U < d < 4 - d_U$

Source: Gujarati (2003 ,p. 470)

The null hypothesis is rejected when the decision rule is satisfied, the null hypothesis states that there is no positive autocorrelation, implying that if we reject then positive autocorrelation is present. However, it should be noted that whenever we add the interbank lending rate as regressor, then the Durbin-Watson test shows no autocorrelation, positive or negative.

Furthermore, a plot of the residuals against the lagged residuals (Figure 6 below) also exhibits a pattern that implies the presence of positive autocorrelation of the error terms.

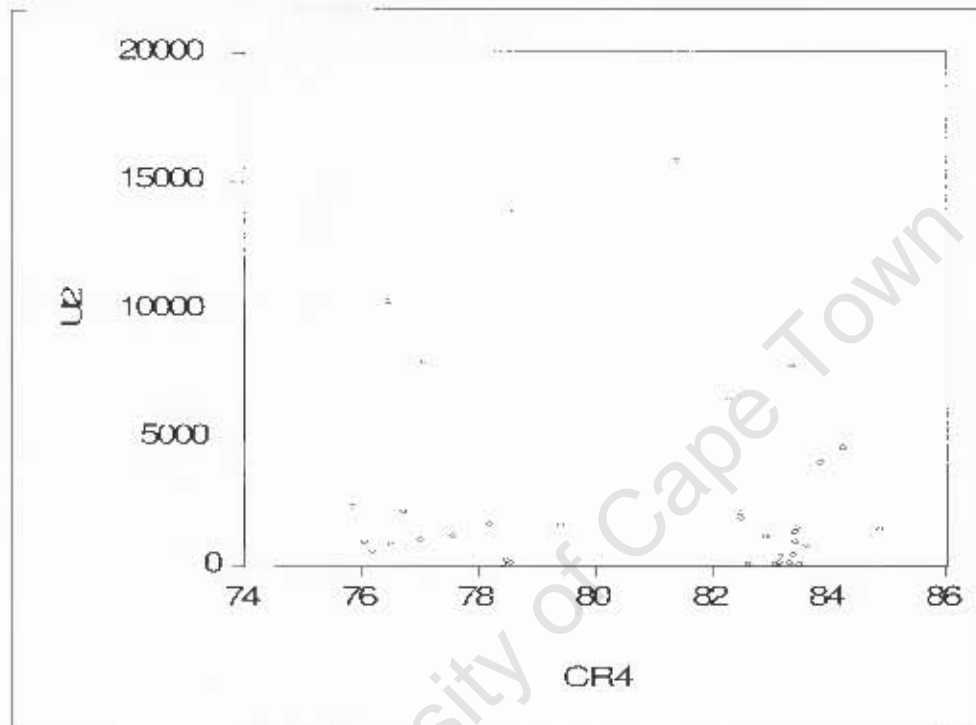
Figure 6 Scatterplot of residuals vs lagged residuals: test for autocorrelation



Testing for heteroskedasticity is a more complicated exercise and a graphical test (Figure 7 below) was performed to determine the presence or absence thereof. The correction mechanism employed to account for both autocorrelation and heteroskedasticity is seemingly unrelated regression (SUR) estimation method. SUR is appropriate when all the right hand regressors Z are assumed to be

exogenous and the errors are heteroscedastic and contemporaneously correlated.

Figure 7 Scatterplot of squared residuals vs X: test for heteroskedasticity



The diagram above is a plot of the residuals from one regression. the squared residuals were plotted against one of the independent variables i.e. the four-firm concentration ratio (CR4). According to Gujarati (p. 403), the pattern observed is one of a number of patterns that is associated with the presence of heteroskedastic error terms.

Table 4 below contains the results of the pooled regression estimations. The exogenous variable is CR4 for the first set of regressions (1') and HHI for the second set (2') respectively. This repeated exercise employing two different measures for market concentration demonstrates the robustness of the estimates. The results are pretty much consistent between the two different measures of concentration.

Table 5 repeats the process but in trying to account for autocorrelation and heteroskedasticity, employs the so-called seemingly unrelated regression (SUR) methodology to correct for these phenomena and ensure that the estimators thus obtained are efficient.

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Table 4 Pooled ordinary least squares (OLS) regression results

	ND32	ND32	FD12	FD12	ND32	ND32	FD12	FD12
			1'				2'	
Constant	3686.4* (832.0)	2351.2* (389.1)	2319.1* (890.7)	1775.6* (677.4)	599.5 (595.7)	1165.1* (281.3)	-127.5 (634.4)	665.6 (485.8)
CR4	-72.56* (8.24)	-24.86* (4.13)	-57.76* (8.96)	-21.64* (7.26)				
HHI					100.2* (11.93)	-28.78* (6.099)	-79.25* (13.01)	-21.31* (10.71)
WAGESSA	-0.223* (0.015)	-0.077* (0.008)	-0.196* (0.017)	-0.079* (0.015)	-0.237* (0.017)	-0.073* (0.010)	-0.207* (0.019)	-0.071* (0.017)
PCINC	0.235* (0.024)	0.029* (0.013)	0.236* (0.026)	0.054* (0.023)	0.196* (0.024)	0.013 (0.013)	0.204* (0.026)	0.039** (0.023)
DEPGRO	-22.74* (4.64)	-4.37** (2.24)	-19.53* (5.10)	-5.45 (4.00)	-21.60* (4.68)	-3.60 (2.28)	-18.86* (5.13)	-4.68 (4.03)
TA	-5.62E-07* (1.87E-07)	-5.44E-07* (8.69E-08)	-1.16E-07 (2.04E-07)	-1.08E-07 (1.55E-07)	-5.66E-07* (1.89E-07)	-5.44E-07* (8.90E-08)	-1.19E-07 (2.06E-07)	-1.07E-07 (1.57E-07)
JIBAR		0.608* (0.020)		0.490* (0.034)		0.616* (0.020)		0.499 (0.035)
Adjusted R ²	0.600	0.914	0.488	0.705	0.592	0.909	0.481	0.700

Standard errors are in parentheses, * significant at the 5 percent significance level, ** significant at the 10 percent significance level

Table 5 Seemingly unrelated regression (SUR) results correcting for autocorrelation and heteroskedasticity

	ND32	ND32	FD12	FD12	ND32	ND32	FD12	FD12
			1'				2'	
Constant	1420.9 (1426.1)	1817.3* (484.7)	2506.8 (1575.0)	943.3 (732.8)	-244.8 (932.1)	997.8* (328.6)	-123.9 (1166.6)	310.9 (510.7)
CR4	-43.38* (15.17)	-15.97* (5.13)	-53.99* (15.85)	-11.73* (7.86)				
HHI					-66.50* (22.53)	-18.86* (7.27)	-65.07* (24.00)	-10.35 (11.27)
WAGESSA	-0.173* (0.030)	-0.067* (0.011)	-0.186* (0.029)	-0.061* (0.016)	-0.189* (0.035)	-0.066* (0.012)	-0.183* (0.035)	-0.055* (0.018)
PCINC	0.214* (0.034)	0.016 (0.016)	0.209* (0.045)	0.048** (0.025)	0.191* (0.033)	0.010 (0.015)	0.183* (0.047)	0.039* (0.024)
DEPGRO	-19.42* (9.60)	-3.43 (2.94)	-19.14* (9.02)	-4.85 (4.32)	-18.72* (9.49)	-3.07 (2.85)	-18.66* (9.44)	-4.52 (4.24)
TA	-4.53E-07* (5.82E-08)	-4.62E-07* (5.59E-08)	-1.54E-07* (5.06E-08)	-1.55E-07* (5.07E-08)	-4.54E-07* (5.84E-08)	-4.60E-07* (5.59E-08)	-1.58E-07* (5.06E-08)	-1.54E-07* (5.08E-08)
JIBAR		0.611* (0.037)		0.506* (0.037)		0.613* (0.025)		0.520* (0.037)
Adjusted R ²	0.579	0.911	0.483	0.703	0.577	0.907	0.473	0.698

Standard errors are in parentheses. * significant at the 5 percent significance level, ** significant at the 10 percent significance level

5.3 Discussion

According to Bresnahan, the central inference in the stylized model is about firm and industry conduct: the goal is the estimation of parameters measuring the degree of competition (1982, p.1014).

The results are very consistent across estimations. In broad terms the implications of the analyses are as follows: the rate paid for each type of deposit specified in basis points, is decreasing in concentration. Furthermore, the rate paid on deposits is decreasing in the cost proxy in the form of wages and scale variables such as total assets. The latter implies that larger banks offer lower deposit rates to their customers, all else equal (Hannan, 1997, p. 32).

The inclusion of an alternative competitive cost funding variable in the form of the interbank lending rate (JIBAR) reveals that the basis point reduction is not as high on deposit rates as in the absence of the variable. The average basis point reduction is only 24.1 when the JIBAR rate is included compared to 77.4 BP in the absence thereof using CR4 as measure for market structure.

The analysis across deposit types reveals interesting patterns. The 32 day notice deposit account (ND32) generally declines by a greater magnitude (see Table 4) relative to the 12 month fixed deposit instrument (FD12) even when the interbank lending rate JIBAR is included in the regression.

The coefficient of total assets is very small and turns out mostly statistically significant, therefore the contention that larger banks offer lower deposit rates seems to be supported by the results, dummy variables tests using a BIG4 dummy also support this contention (results not shown here). The coefficient for total market deposits growth gives consistently negative coefficients implying that greater supply of funds to the industry confers greater market power. These estimates turn statistically insignificant when alternative competitive bank funding

sources are included. Increased per person income increases the pool of funds available probably due to greater disposable income making it more cost effective for banks to manage deposit funds, it marginally raises the rate paid and the coefficient is statistically significant.

The results support the SCP paradigm since it implies that higher concentration of market demand deposits results in lower interest rates on consumer deposits, *ceteris paribus*. The coefficient on the market structure variable (CR4) is highly statistically significant and negative for all types of deposit accounts. The rates paid on deposit accounts decline by between 20.0 BP when the interbank lending rate is included to 77.4 BP. Thus, following a 10% increase in market concentration one can expect the rate paid to decline by anything between 0.10% and 1.00%, all else equal.

The specification tests are valid overall with the F-statistics obtained indicating thus. Gilbert (1984, p. 626) in his survey paper reported results from several papers⁷ on the response of bank performance measures to changes in the market concentration ratio. These studies reported declines ranging between 0.05 and 18 basis points on interest paid on time (fixed) and savings deposits.

In terms of other explanatory variables, the coefficient for market per capita income (PCINC) is positive, statistically significant at the 5 percent level but is relatively small in magnitude. Increasing per capita income raises the rate earned by individuals on savings deposit instruments held with banks. The local financial institutions' wage index is, as expected, negative implying that increasing costs narrows the scope for price competitiveness as banks try to maintain margins. Therefore, banks have to lower the rates paid on deposits in the case that the cost structure of the business evolves i.e. greater costs assuming no accompanying labour and technology efficiency improvements. It should be

⁷ Edwards, Kaufman, Harvey, Whitehead, Rose and Scott, Savage and Rhoades, Hannan respectively

pointed out that the cost proxy in the form of wages does not nearly capture the total cost structure of banking and therefore does not account for the overall impact.

Hannan (1991) formalised the predictions of the SCP hypothesis and showed that all else equal, the expected sign on the coefficients for market structure proxies and market share respectively are negative with respect to deposit rates. Furthermore, the rate offered for each type of deposit is increasing in the security rate, decreasing in the marginal costs associated with handling deposits and increasing in the elasticity of supply of deposit funds.

The author shows that deposit rates paid are decreasing in concentration⁸, which is consistent with our empirical findings using both measures of market concentration, CR4 and HHI respectively. The cost proxy in the form of the financial services sector average monthly salaries turned out negative as predicted by Hannan. If per capita income proxies for the elasticity of supply of deposit funds, then the sign of this variable is also consistent with the theoretical prediction.

⁸ See Hannan (1991) reference in References section

6. SUMMARY AND CONCLUDING REMARKS

The study analysed the relationship between interest rates paid on consumer deposits and the structure of the South African banking market, or price-concentration relationships. Not much formal analysis has been conducted prior to this for the local banking market and this study aims to contribute towards an understanding of the determinants of banks' conduct and performance.

Okeahalam emphasises the need for better measures of efficiency to determine what the factors are that influence the relatively good performance of local banks. In the light of this and the results of this study, one can conclude that market concentration and the relatively protected environment under which banks operate are determinants of bank deposit rate setting. This price setting is generally less favourable to consumers in that banks pay lower rates on deposit accounts (the results show reductions ranging from 0.10% to 1.00% on average) as a result of the market power that they wield. Assuming an average rate over the period of 11.4% (see mean 32 day notice deposit rate, Table 2), deposit instruments paid anything between 11.3% and 10.4% on average, *ceteris paribus*.

The results of the study have shown that the coefficient for market structure (CR4 and HHI) is negative and highly statistically significant (see regression output). This is the case both when we employ the CR4 and HHI respectively as proxies for market concentration, such that higher market concentration gives rise to lower deposit rates having controlled for the interbank lending rate. This implies that greater concentration has negative welfare consequences for consumers of banking deposit products.

The inclusion of the interbank lending rate, to account for alternative competitive sources of bank funding, adds significant explanatory power to the results. The

remaining explanatory variables also explain significant structural aspects of the market and firm-specific factors.

The policy implications of the study relate to the impact of industry structures on the competitive behaviour of firms and consumer welfare and efficiency considerations emanating from that. The public interest considerations for competition policy and distributional considerations following from market power effects are important to competition authorities. The Competition Act, Act No. 12 of 1998, states that an “efficient, competitive economic environment, balancing the interests of workers, owners and consumers and focused on development, will benefit all South Africans”. The considerations of the Act and the prevalence of large profits that could potentially be attributed to an uncompetitive economic environment make this a pertinent public policy issue.

The relevance of formally establishing a relationship between structure and conduct in a particular industry sector that influences pricing decisions and social welfare could be of value to the work of the competition authorities. Other industries can also benefit in terms of the analysis of industry pricing and/or cost structures and the relationship with market structure. Furthermore, the recent criticism by the Governor of the SARB on banks’ 3.5% margin convention is a case in point⁹. These policy implications should however take into consideration the systemic risks posed to the financial system of an unregulated or under-regulated industry and the unique role of banks in the economy both from a social and economic viewpoint.

The deterioration in savings in the South African economy is a challenge that the political authorities are quite concerned about¹⁰. A possibility for further research areas could be the determination of the interrelationships between aggregate savings in the economy and the (dis) incentives framework for household

⁹ Financial Mail, 10 February 2006

¹⁰ The national savings rate as a percentage of gross domestic product is quoted at around 13% to 15% by different financial institutions currently, having declined from 19% in 1991

savings. The latter relates to the margin commercial banks earn and the deposit rates they offer on different deposit instruments and the role of market structure could be an important determinant in this regard.

The results of the study should be qualified in the light of the criticisms of the SCP raised in Sections 3.2 and 3.3 respectively. Notwithstanding these qualifications, some studies (see Fourie and Smith, 1998, p. 271) have found firms in consumer good industries (e.g. retail deposits market) showed stronger discretionary pricing decisions because buyers in consumer good industries typically have weaker bargaining positions, this contention renders the findings of this study plausible.

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