

Estimates of Banking Competition in SA Loan Markets*

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Abstract

This paper estimates the extent of competition between South African banks for the provision of loans between 2008 and 2022. This is achieved through the estimation of loan-specific Lerner Indices for 6 South African banks. We use accounting data and estimate multi-output translog cost functions to estimate bank marginal costs. Our results reveal differences in the evolution of market power, with half the banks in our sample experiencing increases in market power while the remainder experienced decreases. We construct a weighted average Lerner Index to approximate national market power. Our results indicate a general decline in bank market power over time - which is inferred to indicate increased competition for loan products in South Africa. We contrast this estimate with a structural measure of competition for loan provision over the same period. The Lerner Index and the structural measure trend in the same direction although the correlation between the two measures is low.

1 Introduction

The banking industry in South Africa has undergone significant change in post-Apartheid South Africa. These changes include market structure changes owing to bank consolidations, exit and entry, as well as changes in financial regulation that have altered the products offered by banks and bank conduct more generally. The nature of these changes are likely to have impacted on the manner in which banks have competed against each other over time with this competition, likely, directly affecting economic welfare.

The main output of banks are the loans they extend to various household and corporate customers

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since a bank’s primary role is to serve as an intermediary between depositors and borrowers (Xavier and Jean-Charles 2008). The competitive conditions under which these loans are provided impact on access and usage of credit materially impact the production of various products in the South African economy. By way of example, the OECD (2008) finds that banking competition can play a role to better conditions of access through lower interest rates and lower requirements for collateral. Moreover, competition between banks also affect other macroeconomic and policy relevant variables such as financial sector stability, monetary policy transmission and financial inclusion efforts (Berger, Klapper, and Turk-ariss 2009; Van Leuvensteijn et al. 2013; Gwatidzo and Simbanegavi 2024).

It is against this backdrop that this paper estimates the extent of competition in South African loan markets between 2008 and 2022. We proxy competition through market power which represent a bank’s ability to price their loans above marginal costs. We obtain a measure of market power by estimating Lerner Indices for 6 banks between 2008 and 2022. These banks include Firststrand, Absa, Standard Bank, Nedbank, Capitec and Investec. The two key inputs into the Lerner Index are the prices charged for loans and the marginal costs of providing those loans. These loan-specific marginal costs are computed following the estimation of a multi-output translog cost function that recognises the multi-product nature of banks. We obtain national estimates of competition by calculating a loan-weighted average Lerner Index that we compare with an alternative, structure-based, estimate of market power, the Herfindahl-Hirschman Index (HHI).

We find differences in the evolution of the market power held by banks over time. Our results indicate that half the banks in our sample experienced increases in market power and the remainder experienced decreases. Most notably, Capitec and Firststrand experienced significant increases in market power over the sample period. Standard Bank experienced the largest decline. Our national loan-weighted average Lerner Index values trend downward over time, which is inferred to relate to a general increase in the competition for loan products in South Africa. The trend in this national estimate is driven by the aforementioned decline in Standard Bank’s market power due to extent of its market power decline and its large share of loans in our sample. HHI values, estimated for the provision of loans, similarly declines indicating less concentration in the provision of loans. However, we find low correlation between the structural measure and the direct estimate of market power.

The primary contribution of our analysis is the estimation of the market power held by banks in the provision of loans products. These estimates proxy the extent of competition in South African

loan markets. To the best of our knowledge, there are limited studies in the South African literature estimating banking competition for a subset of banking products. Other studies are largely focused on the entire banking industry where total bank assets are considered as the key output variable. This approach, also common in the international literature, does not consider the multi-product nature of banks. As we describe later, banks provide loans, obtain investment income and generate off-balance sheet income. Providing Lerner Index values on the basis of total bank assets has the potential to provide inaccurate measures of competition.

This paper is structured as follows. First, we provide a review of literature on the estimation of competition. Second, we provide an overview of our empirical approach to estimating bank market power. Third, we describe the construction of our dataset. Fourth, we provide our results and, lastly, conclude.

2 Literature review

Market power refers to a firm's ability to price above its marginal costs. This cost represents a competitive price as its the lowest price that a firm could set.¹ Motta (2004) indicates competition policy, comprised of laws and policy that intend to ensure that competition isn't restricted, is primarily concerned with maximising economic welfare.² Market power has the potential to reduce the economic welfare that competition policy aims to maximise. With market power, consumers would pay too high a price leading to the loss of allocative efficiency (Motta 2004). Additionally, firms with market power may be less efficient leading to the loss of productive and dynamic efficiencies. Church and Ware (2000) refers to X-inefficiency and costs incurred in pursuit of rents as contributors to welfare losses from market power.

Competition and its relationship to market power is viewed from a static and dynamic point of view (Leon 2014). Competition was initially defined by Cournot (1838) as a static state where the prices of a firm equal the marginal cost of production. A number of conditions are assumed to hold within that state, including a existence of a large number of firms, complete information, and the free entry and exit to and from a market (Leon 2014; OECD 2021). Monopolies represented the opposite of this competitive state as monopolists have the greatest amount of market power (Leon 2014). Oligopoly theory recognised that, in reality, many markets reflect mixtures of monopoly and perfect competition

¹This is the equilibrium outcome associated with perfect and Bertrand model of competition.

²Motta (2004) explains further how jurisdictions differ in the welfare standard they may primarily pursue

models (Leon 2014). Underlying this array of models is the idea that the more competitive a market is, the less likely a firm is to have market power, earn high levels of profit or have an ability to translate cost increases into revenue increases (OECD 2021).³ A dynamic view of competition recognises that firms engage in a process of rivalry where competition between firms result in improved conduct by firms (pricing, quality, innovation, etc.) and lead to the exit of inefficient firms. In this dynamic view, a competitive market may confer onto innovative firms, momentary market power before other firms later replicate the innovative firm’s efforts thus lowering the market power initially held. Market power is not incompatible with the degree of competition for a specific amount of time, however over longer periods of time this market power may be lower (OECD 2021). These two views of competition have spawned a host of empirical approaches that have been applied to estimating market power and competition, more generally. These can be categorised into two distinct approaches.

The first relies on the structure-conduct-performance (SCP) paradigm; which is underpinned by the view that the structure of an industry is related to the market power held by firms and how competitive a market is. Based on the SCP, the structure of a market directly influence firm conduct. Conduct relates to the strategies that firms would pursue, such as pricing strategy, choice of quality and advertising, as well as including whether firms opt for collusive strategies (Leon 2014; Panhans 2024). This conduct, in turn, affects the performance of the market, as measured by variables such as profitability, allocative and productive efficiencies (Tan 2014). The erstwhile European Commissioner for Competition Policy, Mario Monti, indicated that market power was central to competition assessments and that market definition, together with structural measures, are used as proxy market power.⁴ Examples of structural measures include the market shares, concentration ratios and the Herfindahl-Hirschman Index (HHI). Market shares are calculated for well-defined markets. The HHI is the sum of all squared market shares of the firms in a given market; a higher (lower) value indicates more (less) market concentration (Department of Justice and Federal Trade Commission 2023). Concentration ratios compute the sum of the markets shares for a select group of the largest firms in a market; the concentration ratio for n firms is the sum of the n largest firms in a market by market share.

Structural analysis has been relied upon less in academic work for competitive analysis. This is due

³These concepts refer to the Lerner Index, profitability tests and the Panzar-Rosse model that we describe later.

⁴See Monti (2001)’s speech on Market Definition: “*As in most other competition jurisdictions around the world, our competitive analysis focuses on market power. We use market definition and market shares as an easily available proxy for the measurement of the market power enjoyed by firms. In effect, the main objective of defining a market is to identify the competitors of the undertakings concerned by a particular case that are capable of constraining their behaviour*”

to the contentious relationship between concentration and competition (Bos et al. 2017). There are various instances where higher (lower) concentration may not reflect a less (more) competitive market. The outcome of the Bertrand model of competition is that the equilibrium price will equal the marginal cost of production assuming, amongst other things, pricing competition, homogenous goods and no capacity constraints. This is a paradox as the few firms that produce the homogenous good will have no market power in equilibrium (Tirole 1988). Similarly, few firms in a market may price competitively as they may be constrained by potential entrants if entry barriers are low (Baumol et al. 1982). Firm efficiency also explains why the causal relationship between concentration and competition may not hold. High concentration may be a function of more efficient firms gaining market share at the expense of less efficient firms (Leon 2014). Additionally, structural measures are also unable to relate to a competitive benchmark (Shaffer and Spierdijk 2017). Despite this, competition authorities continue to rely on structural measures for screening purposes, particularly in mergers (Bos et al. 2017). The US Department of Justice and Federal Trade Commission (2023) merger guidelines indicate that they will consider changes in market concentration as indicators of a potential substantial lessening of competition. The European Union (2004) guidelines on horizontal mergers similarly indicate that *“[m]arket shares and concentration levels provide useful first indications of the market structure and of the competitive importance of both the merging parties and their competitors.”*

The second approach to estimating competition requires the direct estimation of bank conduct or performance to infer competition (Degryse and Ongena 2008). There are a number of methodological approaches to achieve this and they form part of what is referred to as the New Empirical Industrial Organisation. Commonly used methods include Lerner index which directly estimates market power, as well as Panzar-Rosse model and Boone Indicator, which estimate other types of bank conduct (Lerner 1934; Rosse and Panzar 1977; Panzar and Rosse 1982; Panzar and Rosse 1987; Boone 2008). Each of these methods have unique advantages and shortcomings.

The Lerner Index is a measure of the margin earned on the products it sells. It is expressed as the difference between the price of the product sold and its marginal cost divided by the price of the product (Lerner 1934). Primary advantages of the Lerner Index include the ability to provide frequent market power estimates at a bank and/or product level. This enables a comparison of market power between banks and/or across products over time (Leon 2014; Shaffer and Spierdijk 2017). It is inferred that the lower the index, the greater the competition between banks. Conversely, the higher the index, the lower the competition. Leon (2014) indicates that this relationship may not always hold. For instance,

firms that are more efficient may have greater market power than less efficient rivals, if these efficient banks are able to obtain greater market share from the less efficient rivals then a market/industry share-weighted Lerner index may increase. Similarly, firms that have supra-competitive revenues may have the ability to support supra-competitive expenses, thus lowering the index (Shaffer and Spierdijk 2017). Despite these shortcomings, the Lerner index is one of a few measures of competition that are described as “least objectionable” with lower data requirements (Shaffer and Spierdijk 2017).

The Panzer-Rosse model considers how much of an input price increase translates into total revenue increases (Rosse and Panzar 1977; Panzar and Rosse 1982; Panzar and Rosse 1987). The Panzer-Rosse model computes a statistic, referred to as an H-statistic, that is derived from the regression of firm revenue to input prices (Leon 2014). The H-statistic is the sum of input price elasticities (Leon 2014). In perfectly competitive or perfectly contestable markets an H-statistic would be equal to 1, where a 1% increase in input prices translates into a 1% increase in firm revenue (Shaffer 1982; Leon 2014). Leon (2014) indicates that values between 0 and 1 indicate monopolistic competition. Negative H-statistics provide evidence of a monopoly where input price increases translate into negative changes in total revenue. The Panzer-Rosse model can be applied to data that is not specific to a well-defined market. Van Leuvensteijn et al. (2011) indicate that the Panzer-Rosse approach has largely been used to estimate competition for the entire banking market. This lowers the data requirements of the model and is one of its distinct advantages. Barbosa, Paula Rocha, and Salazar (2015) extend the Panzer-Rosse model to account for the multi-product nature of banks, revealing that the H-statistic may be positively biased with a simpler model. Finally, the H-statistic is estimated for a given period of time. To consider differences in competitive conditions over time, an analysis would have to compare H-statistics across countries, on an annual basis or for one period with another.

Boone (2008) introduced a measure of competition that is premised on the view that the re-allocation of output from less efficient firms to more efficient firms is greater under more competitive conditions. The Boone Indicator is the estimated coefficient from the regression of firm profits or market share on a firm’s marginal costs (Boone 2008; Leon 2014). The Boone indicator has a number of advantages that have resulted in its increasing adoption in empirical work. Leon (2014) indicates that the primary benefit of the Boone indicator is that profit and cost are continuous and monotonic. Its data requirements are low as it only requires information on profits/markets shares as well as cost. The cost measures include the more readily available average variable cost measure or an estimated marginal cost (Griffith, Boone, and Harrison 2005; Leon 2014; Rapapali and Simbanegavi 2020). The

Boone indicator, similar to the Panzer-Rosse and Lerner index, can estimate competition for different product segments. Van Leuvensteijn et al. (2011) estimate the indicator for lending markets in 5 EU countries, the UK, the US and Japan between 1994 and 2004. They find that the US has the most competitive loan market. In this context, the Boone indicator is particularly useful when contrasted with other estimates (across product segments, across countries or within-country across time). Guevara and Maudos (2017) estimates and contrasts Boone indicators (and Lerner indices) estimated for the loan markets of 13 European countries. For each country, they provide indicators for the periods 2002-12, 2007-2007 and 2008-2012. Their approach allows for a cross-country comparison for a given time period but also allows them to assess how the extent of competition changes within each country following the global financial crisis.

There is empirical work in South Africa that has estimated bank competition relying on the methods described above. Most of this analysis has been at the level of the industry with little attention paid to product segments (see Kasekende et al. 2009; Mlambo and Ncube 2011; Simatele 2015; Simbanegavi, Greenberg, and Gwatidzo 2015; Moyo 2018; Gwatidzo and Simbanegavi 2024). Rapapali and Simbanegavi (2020) is a notable exception given their estimation of separate Boone indicators for SA bank loans and deposits between 2008 and 2018. Their results indicate that there is relatively greater competition in the loan market. However, their analysis is unable to describe the evolution of competition in SA loan provision as they provide a single measure for competition over the period. Moyo (2018) and Gwatidzo and Simbanegavi (2024) provide annual estimates of bank competition over time but their analysis is, unfortunately, not focused on loan provision. The analysis in the South African banking literature is, in the most part, likely driven data availability. This view is shared by Rapapali and Simbanegavi (2020). This is not the case in European and US studies where there is greater access to data on various banking activities.

In other jurisdictions, estimates of competition often follow significant regulatory changes that had the potential to alter competitive conditions faced by banks in those regions. An example of this is the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1992. This Act enabled banks to establish bank branches in different states (Dick 2006).⁵ The US' Gramm-Leach-Bliley Act further deregulated US banking by removing the legal barriers that prevented commercial banks from engaging in other activities, such as investment banking, securitisation and offering insurance (Yeager 2007;

⁵Prior to this, Dick (2006) indicates that interstate banking was permitted when a bank in one state purchased a bank in another state. However, the purchaser bank was not able to operate in the new state under its own brand.

Lamers and Purice 2017). These regulations notionally increased the contestability of various banking markets in the US (Lamers and Purice 2017). In the European Union (EU), the First and Second Banking Directives of the European Council provided rules for banks operating in the common market and intended to harmonise bank regulation in member states (Smits 1997), hence studies that assess convergence in competition of banking markets across these member states.

This article contributes to the existing South African literature analysing bank price-cost margins to infer banking competition. We do so by estimating Lerner Indices for the banks in our sample. This measure is better suited given the nature of South African banking and the availability of data. Structural measures are inadequate measures of competition due to the significant concerns about the direct relationship between structure and conduct. Our estimated Lerner Indices will allow us to track the evolution of bank competition over time. Departing from existing literature, our approach is focuses on a similar category of products issued by banks - loans. This approach mitigates the aggregation bias that can be associated with estimating markups at an industry level (Bos et al. 2017).⁶ Our analysis follows significant developments in the regulation of SA banks that may have affected the contestability of SA banking markets, as well as the conduct of banks. Financial sector laws such as the National Credit Act of 2005 and various amendments to its regulatory framework facilitated the entry and expansion of banks (Makhanya and Nhundu 2016).⁷ In addition, South Africa’s small bank crisis of 2002/3 resulted in the de-registration of half the country’s banks (Havemann 2021). These South African developments have had the potential to change the competitive conditions faced by banks over time. Across all jurisdictions, the global financial crisis has also impacted on the market structures of various banking markets and led to prudential regulations regulations that have affected bank conduct (Sibande et al. 2025).

3 Model Framework

This study provides a continuous measure of competition in the provision of loans in South Africa over time. For each, bank we will estimate a Lerner Index for the loan segment of their business; this measures the market power a bank has in the provision of loans. We proxy national competition through the estimation of a loan-weighted Lerner index; where each bank’s Lerner Index is weighted

⁶Importantly, we note that due to data availability we’re unable to break down the loan segment we construct even further. This is a limitation of the study.

⁷See Sibande et al. (2025) for a fuller description of these financial sector reforms.

by the total size of their loan book. This adjusted measure will provide an indication of the average market power held by South African banks. Consistent with empirical literature, we assume that a larger Lerner index is indicative of lesser competitive constraints on banks in the provision of loans.⁸

Equation (1) provides the aggregate Lerner Index we estimate to measure competition at time t . The individual index (LI_{it}) for bank i at time t , provided in Equation (2), is weighted by each bank's share of all loans provided by all B banks at time t , provided in Equation (3). The price charged by bank i at time t is the average interest rate it charges for its loans. mc_{it} is the marginal cost incurred by each bank at time t for the provision of loans and is estimated separately. We describe this estimation further in the section below.

$$LI_t^{aggregate} = \sum_i^B w_{it} LI_{it} \quad (1)$$

Where

$$LI_{it} = \frac{(P_{it} - mc_{it})}{P_{it}} \quad (2)$$

and

$$w_{it} = \frac{Loans_{it}}{\sum_j^B Loans_{it}} \quad (3)$$

3.1 Marginal cost

Marginal costs are not observed and can be derived from the estimation of cost functions. The translog cost function is a flexible expression of the Cobb-Douglas cost function that is linear in its parameters (Greene 2003; Coelli et al. 2005). A number of articles in the banking literature use this cost function to derive the marginal costs of banks (Daglish et al. 2015). It is common for the articles in this literature to derive a cost function that is premised on 3 key inputs: labour, physical capital and debt.

In addition, a large share of the literature estimate costs on the basis that banks are single product

⁸A well-defined market, from a competition economics perspective would require that we define the product and geographic bounds of a specific market (Motta 2004). SA case law indicates that loan segments can be further segmented into separate markets such as credit cards, overdraft facilities, personal loans. As we describe later in this study, we do not have sufficiently granular data to provide an analysis at that level. Instead, we focus on all loans provided by banks; one step removed from the ideal market. This provides an improvement from existing literature which assesses competition for all bank activities.

firms; where the bank's total assets are used as a proxy for firm output (Shaffer and Spierdijk 2020).

We estimate a translog cost function premised on a bank utilising 4 inputs (labour, wholesale debt, consumer debt and physical capital) to produce 3 outputs (loans, investment income and off-balance sheet income).⁹ To the best of our knowledge, there are no studies in South Africa that estimate multi-product Lerner Indices. The multi-product cost function we estimate is provided in Equation (4) below. To ensure that the estimated cost function is homogenous in input prices, we normalise all inputs and costs by dividing them by the price of capital. The normalised costs and prices are represented by tilde.

$$\begin{aligned} \ln(\tilde{cost}_{it}) = & \sum_{j=1}^3 \beta_{jq} \ln q_{j,it} + \frac{1}{2} \sum_{j=1}^3 \beta_{j,qq} (\ln q_{j,it})^2 + \sum_j \sum_{k>j}^3 \beta_{jk,qq} \ln q_{j,it} \ln q_{k,it} + \sum_{l=2}^4 \beta_{l,it} \ln \tilde{p}_{l,it} + \\ & \frac{1}{2} \sum_{l=2}^4 \beta_{l,pp} (\ln \tilde{p}_{l,it})^2 + \sum_{l=2}^4 \sum_{m>l} \beta_{lm,pp} \ln \tilde{p}_{l,it} \ln \tilde{p}_{m,it} + \sum_{j=1}^3 \sum_{l=2}^4 \beta_{jl,qp} \ln q_{j,it} \ln \tilde{p}_{l,it} + \alpha_i + \alpha_t + \epsilon_{it} \quad (4) \end{aligned}$$

$q_{j,it}$ represents bank i 's output j at time t . $\tilde{p}_{l,it}$ is bank i 's normalised input l at time t . We also include bank and time fixed effects, which are respectively represented by α_i and α_t .

We calculate bank i 's marginal cost of producing output j at time t by first deriving the estimated translog cost function with respect to logged output j and a ratio of bank i 's cost to output. Given that the focus of this paper is primarily the estimation of the Lerner index for bank loans, we estimate the marginal costs associated with providing an additional loan. Our marginal cost expressions is provided in Equation (5).

$$mc_{j,it} = \frac{cost_{it}}{q_{j,it}} [\beta_{jq} + \beta_{j,qq} \ln q_{j,it} + \sum_{k>j} \beta_{jk,qq} \ln q_{k,it} + \sum_{l=2}^4 \beta_{jl,qp} \ln \tilde{p}_{l,it}] \quad (5)$$

4 Data

The data we require to compute the Lerner Indices is obtained from two data sources. The first is a BankFocus dataset available from Moody's Analytics. The BankFocus data provides access to the financial statements of various banks in South Africa. The second is bank balance sheet data obtained

⁹Koetter, Kolari, and Spierdijk (2012) provides multi-product Lerner Index estimates on the basis that banks in the US use labour, physical capital and deposits to produce loans and securities.

through Codera Analytics. This balance sheet data is often referred to as BA900 data and is provided to the South African Reserve Bank as part of the banks' regulatory reporting to the South African Reserve Bank. We obtain the consolidated bank submissions through Codera Analytics. Our analysis considers 6 banks between 2008 and 2022; namely, Absa, Firststrand, Nedbank, Standard Bank, Capitec and Investec. The South African Reserve Bank (2025) reports that there were 28 banks registered banks in South Africa in December 2024. The banks we include in our study accounted for 93% of total assets and 96% of all loans issued in South Africa.¹⁰

Our analysis relies on accounting data which is often not presented in a manner that is easy to use for our economic analysis. The first challenge is the reporting period. Each bank has different financial years. As such, the variables we require span over different periods across banks. Our analysis uses calendar years to measure time. For banks with financial years that end in the beginning of each year, its data is lagged by a year. For instance, Capitec and Investec's financial years end at the end of February and March respectively implying that their data includes 9 or 10 months of the previous year. The BankFocus data makes these adjustments by lagging the reported data.¹¹

Another challenge is that many of the variables we require need to be constructed from the aforementioned data sources. The input variables are captured as follows. The price of labour is calculated as the reported staff expenses divided the value of a bank's total assets. The data does not report the number of each bank's employees and we rely on total assets to compute a labour rate. This is consistent with Weill (2013) and Moyo (2018). Interest on borrowed customer funds is computed as a bank's interest expenses on consumer deposits divided by consumer deposits held by these banks. Interest on wholesale debt is computed as the interest expenses on debt securities divided by value of wholesale debt. Data on the value of wholesale debt and consumer deposits are obtained from the SARB data as the BankFocus data contained missing data for some banks. The price of capital is calculated as total operating expenses less staff expenses (which are accounted for explicitly elsewhere) divided by the value of a bank's fixed assets. Our output variables are captured as follows. Total loans are the value of gross loans and advances to consumers. Investment income is the sum of interest and dividends from securities. Off-balance sheet income is net fee and commission income. The total costs we require in the estimation of the marginal costs is calculated as the sum of interest and non-interest

¹⁰Loans are calculated as the sum of bank assets classified in the BA900 regulatory submissions as installment debtors, mortgage advances, credit card debtors, overdrafts loans and advances to the public and private sector.

¹¹FNB's reporting ends in June each year. The BankScope data reports their financial year results as calendar years. The financial years of all other banks considered in our analysis end on the 31st of December; necessarily equating their financial and calendar years.

banks expenses. Finally, interest rate earned by banks on loans is calculated as the difference between total interest income, and interest income and dividends on securities, divided by the total loans extended to customers. The reported income by banks contains interest earned from loans and from securities. We subtract interest and dividends on securities from the total reported interest income; else, our calculated interest rates would be biased upwards. We provide a summary of these variables' construction in Table A1 in Appendix 1.

4.1 Descriptive statistics

Table 1 provides a summary of the variables used in this analysis across 2008 to 2022 reported for each bank. The average interest paid on customer funds ranges between 3% - 6% across the banks. Capitec pays the highest interest rate with, Standard Bank paying the least. The average interest on wholesale debt is between 4% - 15% across banks, with Absa being on the upper end of this range. However, the interest rates Absa has paid on their wholesale debt decreased significantly over time. Firststrand paid the least in interest on this debt throughout this period (save for 2008 where they paid the second least after Standard Bank). The wage rates across all banks have been steady. Excluding Capitec, banks paid R0.01 and R0.02 for each Rand they had in assets. Capitec with a significantly lower asset base paid an average of R0.05 for each Rand in assets. Capitec's computed wage rate has declined over time as its asset base has increased. The average price of capital ranges between R1.11 and R3.71 for each range in bank assets. Investec's average is the largest although this changes in 2017 when there is a 10 fold increase in asset values, after which it has the smallest cost of capital.¹² Capitec's price of capital decreases over time indicating that their property and equipment values have increased at a greater rate than their operational costs.

Bank assets provide a measure of the sizes of bank balance sheets. Standard Bank is the largest by a margin with an average of R1.2 trillion in assets. This is followed by Firststrand, Absa and Nedbank with assets between R836 and R960 million. Capitec and Investec are the smallest; although the differences between them are large. The banks are similarly positioned with respect to total loans issued. Standard bank has, on average, issued the largest value of loans; Capitec has issued the least. Firststrand's growth of loans is particularly notable as they issued the fourth largest amount of loans in 2008; by 2022 they were second to Standard Bank. The investment income generated by the Big-4

¹²According Investec's 2018 annual report their property and equipment increases from R274 million in the 2017 financial year to R2.494 billion to the 2018 financial year (Investec 2018).

banks fall within the range of R4.5 and R6.6 billion. Investec generated an average of R1.3 billion and Capitec earned the least with R754 million. There are significant differences in the off-balance sheet income generated by the banks ranging from R22 billion to R2 billion. The Big-4 make up the upper end followed by Capitec at R7 billion and Investec at R2 billion. Finally, the average interest rates set by banks on the loans they issue are similar for the Big-4 banks; they range between 9% and 10%. Capitec and Investec generate considerably larger interest rates at 26% and 11.4% respectively.

Table 1: Descriptive statistics

Variables	Absa		Firststrand		Nedbank		Standard Bank		Capitec		Investec	
	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD	Average	SD
Input prices												
Interest - customer funds (%)	3.74	0.99	4.45	1.27	4.92	1.58	3.03	2.04	6.16	1.24	5.76	0.94
Interest - wholesale debt (%)	14.58	9.21	1.2	0.48	5.96	0.72	2.28	0.79	6.63	3.33	3.79	1.97
Wages (R/Assets)	0.02	0	0.02	0	0.01	0	0.01	0	0.05	0.02	0.01	0
Price of capital (R/Assets)	1.38	0.19	1.1	0.08	1.42	0.13	1.87	0.35	1.95	0.78	3.7	2.75
Output variables												
Total assets (R'm)	960 683.5	257 120.6	1 005 949	348 472.5	836 282.6	228 056.6	1 235 788	334 348.2	76 133.51	60 684.13	374 611.8	136 757.2
Total loans (R'm)	640 509.2	146 899.8	663 028.3	243 394.9	627 376	157 322.5	761 259.5	220 007	42 945.79	28 652.67	204 387	75 321.1
Total securities (R'm)	5 609.87	2 268.1	7 089.83	4 445.37	6 474.47	1 913.76	4 458.8	3 840.05	750.43	768.39	1 298.27	785.78
Off-balance sheet income (R'm)	15 284.4	2 443.93	20 105.87	5 890.01	12 215	2 926.26	16 854.87	2 933.11	5 014.66	3 722.17	1 762.93	768.16
Interest earned on loans												
Price of loans (%)	9.53	1.49	8.87	1.66	8.55	1.37	9.95	2.59	26.08	5.19	11.39	1.14

5 Results

In this Section we provide the results of our estimations. First, we provide the bank-specific Lerner Index estimated for the years 2008 through to 2022. Second, we provide a weighted average Lerner Index to provide a view of national competition levels in South Africa between 2002 and 2022. We contrast this national Lerner Index with an estimate of the HHI, estimated for the same period. This comparison is useful to highlight the correlation between the two measures and the difference in the insights that can be drawn from price-cost margins and structural measures of competition.

5.1 Bank-specific measures of competition for bank loans

Figure 1 provides diagram of the estimated Lerner Indices for the 6 banks in our sample in from 2008 to 2022 (the underlying estimates are provided in Table A3 in the Appendix.) The estimated indices are reported in rates and not percentage terms. The line graphs of each of these banks differ significantly, firstly, revealing differences in the banks' abilities to price above the estimated marginal costs and, secondly, showing differences in the evolution of this market power. The index estimates of the Big-4 banks range between 0.58 and 0.901 between 2008 and 2022, indicating a meaningful ability to price above marginal cost. Capitec and Investec are the only two banks with index values that either lie outside of this range throughout the entire period of analysis or during some periods.

Capitec's market power has experienced significant increases over time. We estimate an index of -0.027 in 2008 and 0.655 in 2022; a difference of 0.682 points over the period. Below marginal cost pricing indicates that resources are inefficiently allocated to the production of a good (Hemming and Miranda 1991), however this pricing strategy may occur to encourage consumption (Tooth 2014). We note that Capitec obtained positive price cost markups the following year. Capitec's market power peaked in 2021 reaching 0.792. Investec's measures of market power are distributed over a lower range, starting at 0.411 in 2008 and ending at 0.409 indicating a marginal decline in market power over this period. Investec experienced notable changes in their Lerner Index throughout the period under analysis; initially declining in 2009 and meaningfully increasing from 2016.

Absa started off with an index measure of 0.757 and had a slightly lower measure of 0.721 in 2022. Although the index decreased by 0.036 over this period. Absa's market power peaked in 2016 with an index of 0.798 and was a minimum of 0.686 in 2013. Despite these changes in Absa's market power, it has remained consistently high throughout the period assessed. Firststrand, like Capitec, experienced

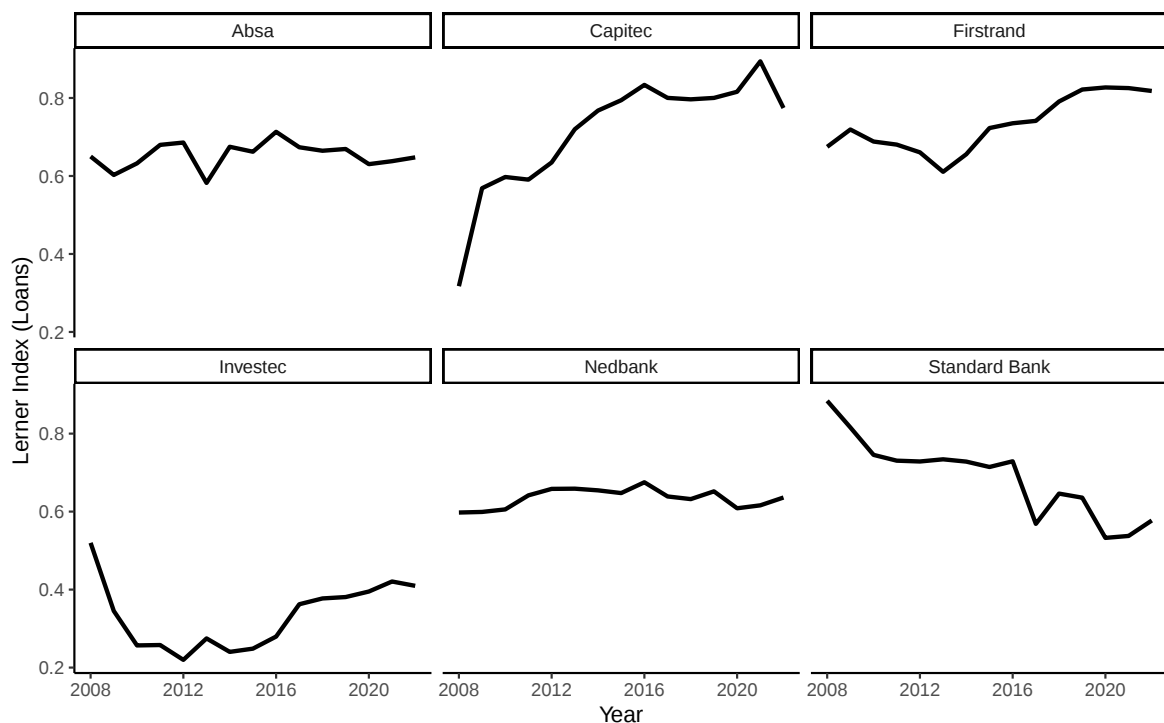


Figure 1: Lerner Index estimates provided for each bank, 2008-2022

growth in their market up over time. However, unlike Capitec, their growth is from a high base of 0.620 in 2008. This increased to 0.843 in 2022, having peaked at 0.867 in 2021. Their growth in market power appears to have meaningfully increased from 2014 onwards. Nedbank's Lerner Index does not indicate significant changes throughout the period. The 2008 estimate was 0.636 and grew marginally to 0.687 in 2022. Between 2008 and 2022, Standard Bank's estimated market power significantly changed between 2008 and 2022. Its Lerner Index was high at 0.901 in 2008 and declined to 0.592 by 2022; an absolute difference of -0.309 points indicating a meaningful reduction in their ability to price above marginal cost.

Figure 1 provides evidence of important differences in the evolution of bank market power between 2008 and 2022. Absa, Standard Bank and Investec have experienced reductions in their market power. However, Standard Bank's reductions are the larger. Firststrand, Capitec and Nedbank have experienced increases in their ability to price above marginal costs. Capitec's gains are the largest over the time frame, followed by Firststrand and later Nedbank.

5.2 National competition for bank loans

In this Section we provide a national Lerner Index to characterise the level of competition in the provision of loan products in the South Africa. The bank-specific measures of the Lerner Index we described above provide an indication of the capacity each bank has to price above their marginal costs. We infer that a bank with rising (decreasing) market power is faced with decreasing (increasing) competitive pressure. The results of the index measures indicate that there are differences in each bank's estimated market power over time and, by extension, the competitive constraints they face. However, placing equal weight to the bank-specific measures of market power may mischaracterise the degree of competition that generally exists at a national level. By way of example, Capitec accounts for 1.3% of all the loans issued by the banks in our sample between 2008 and 2022. Placing equal weight to Capitec's index values with Standard Bank's values, which accounts for 26% of all loans issued in the country between 2008-2022, would provide an upward bias on an assessment of national market power held by banks.

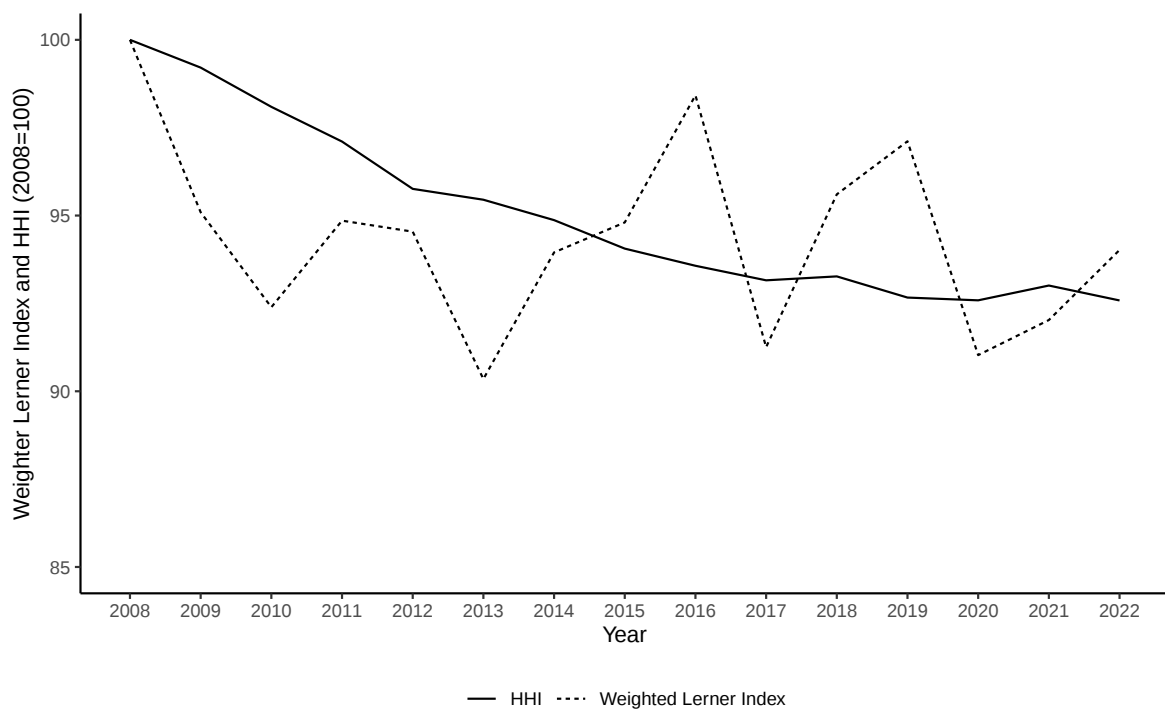


Figure 2: Weighted average Lerner Index estimates and the Herfindahl-Hirschman Index, 2008-2022

We therefore compute loan-weighted Lerner Indices, expressed in Equation (1), to provide a view of the average market power held by banks in South Africa between 2008 and 2022. These estimates are

provided in Table A4 in Appendix 4, starting at 0.757 in 2008 and decreasing by 0.036 points to reach 0.721 in 2022. Figure 2 provides adjusted national Lerner Index values by dividing each years value with the 2008 index value. We provide HHI values calculated for loan provision, but also using 2008 as a base year alongside these adjusted Lerner Index values.¹³ Providing adjusted Lerner and HHI values with a common base year provides a visual representation of how these two measures have changed relative to their 2008 values. The HHI line graph shows that that concentration in loan provision has declined over time. Between 2008 and 2022, the HHI has declined by 7.7%. The decline in the HHI occurs because there are fewer banks that have accounted for the largest share of issued loans over time. Investec accounted for 6.24% of all loans issued in 2008 and Capitec accounted for 0.01%. By 2024, Investec accounted for 7.38% of all loans and Capitec 2%. Firststrand’s market share change is also notable as they were the 4th largest bank in 2008 with a 16.9% share of loans and was the second largest in 2022 with a 22.5% share. The weighted average Lerner Index shows a general decline as well, decreasing by 5.11% between 2008 and 2022. However, the estimated Lerner Index values show greater variation along this path displaying momentary increases in market power, reflecting its sensitivity to bank-specific index estimate changes.

5.3 Discussion

The general trend observed in the national Lerner Index is that, on average, South African banks have had a reduced ability to price above their marginal costs over time (we note that there are increases in certain years). An implication of this result is that, on average, there was more competition between banks in the provision of bank loans between 2008 and 2022 (apart from 2012, 2016 and 2019). However, this average measure of competition should be interpreted with care. The underlying bank-specific measures of market power reveal that not all banks experienced similar changes in market power. Figure 1 indicates that Capitec and Firststrand generally experienced large increases in their market power over time. Conversely, Standard Bank experienced large decreases. Standard Bank, by virtue of consistently being one of the largest banks, by the value of the loans issued, appears to have contributed to the average view of competition shown in Figure 2.

An comparison of the price of loans and the marginal cost of providing that loan, two key components of the Lerner Index, explains the differences in the bank-specific measures we estimate. The

¹³The HHI values are also provided in Table A4 in Appendix 4. HHI values can be reported as being between 0-1 or 0-10 000. We report the former. The HHI value was 0.230 in 2008 and decreased to 0.212 in 2022; a 0.018 point decrease. In Figure 2, we plot adjusted HHI figures that use the 2008 value as a base year.

first panel of Figure 3 presents the average prices charged by banks on their loans and the second presents the estimated marginal costs. Bank loan prices appear to follow the same cycle and bank marginal costs have remained steady (excluding Capitec). Firststrand's marginal costs consistently decline potentially explaining its increased market power. However, a review of their loan prices reveals that they historically charged the lowest rates but towards the end of the period under analysis its loan rates increased relative to other banks. Conversely, estimates of Standard Bank's marginal costs reveal marginal increases over the years. Their loan prices are among the lowest towards the end of the period under analysis. Capitec's loan prices are consistently and significantly above the rates charged by other banks. Their relatively higher prices likely reflect their greater focus on expanding into the unbanked population of South Africa who primarily make use of unsecured lending (Makhanya and Nhundu 2016). This category of loans is riskier as it does not have an underlying asset to serve as collateral to mitigate the impact of consumer defaults (Xavier and Jean-Charles 2008). It is apparent that the significant increase in Capitec's market power is partly driven by the consistent decline in their marginal costs of providing a bank loan. One interpretation of Capitec's market power is that it reflects increasing efficiencies and not the absence of competitive pressure. However, the higher rates charged on their loan products, given their growth in a historically neglected banking population, may have also shielded them from the competitive pressure of other banks who may have primarily served a different group of customers.

The HHI consistently declines in the period under consideration indicating less concentration in the provision of loans. Despite the similar downward trend in the HHI and the Lerner Index, the HHI may not accurately reflect changes in market power. This is exhibited through a low correlation coefficient of 0.44 between the two measures. This result is consistent with Guevara and Maudos (2017) who found low correlation between the HHI and two competition indicators (Lerner Index and Boone Indicator) in their analysis of European bank competition. Our estimates of the Lerner Index and the HHI reveal significant deviations between the two measures, insofar as their implications for bank competition. HHI changes are underpinned by bank market share changes. Different bank market share changes may not be reflected through bank-specific market power changes.

Figure 4 plots each bank's share of the value of loans issued between 2008 and 2022. The HHI decreases as there are fewer banks accounting for the largest share of the value of loans issued, relative to 2008. The dynamism, when interpreted in isolation, may be less suited to showing that firms are facing less competitive conditions and thus have less market power. Absa, Firststrand and Capitec provide

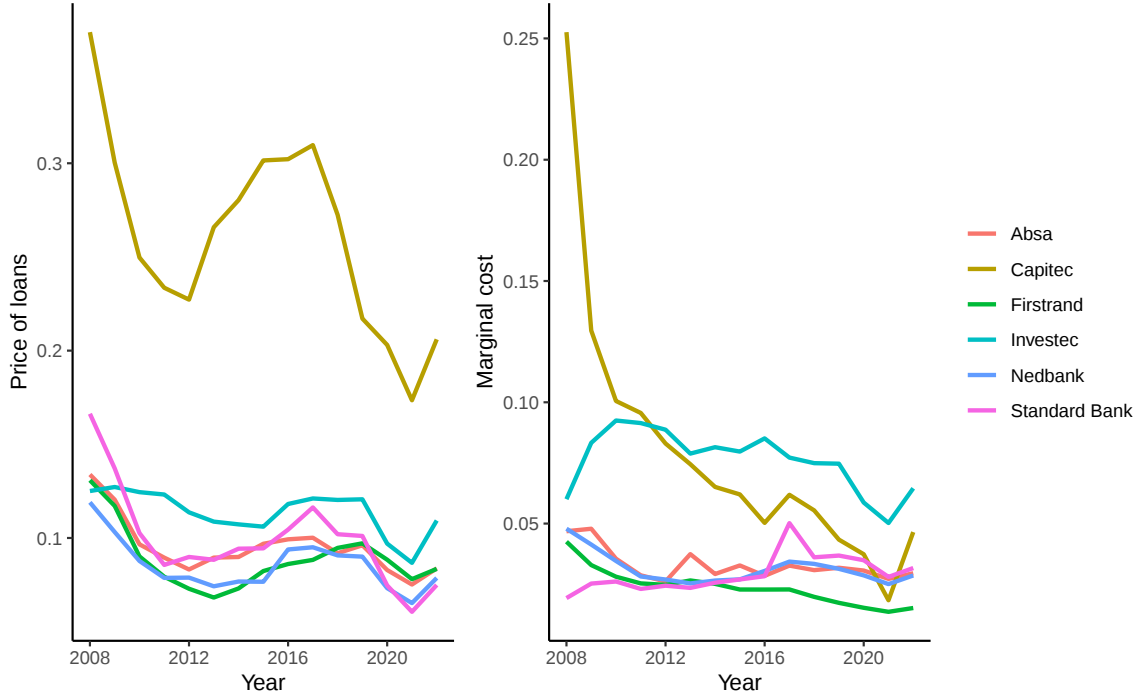


Figure 3: Price of loans and Marginal cost estimates provided for each bank, 2008-2022

examples of this. Absa was the largest bank in 2008 and the third largest in 2022 (it decreased to fourth between 2014 and 2017). This change contributes to a decline in the HHI. The structural approach to measuring competition would infer that Absa faces greater competition and has less market power. However, their market power has reduced slightly between 2008 to 2022 and remains among the highest. Capitec and Firststrand have increased their share of all loans issued. Relative to 2008, these market share changes would have the effect of reducing the HHI over time. Despite the structural measure suggesting that there is greater competition and less market power, we see that Capitec and Firststrand have experienced significant increases in their estimated market power.

6 Conclusion

This paper provides a measure of the level of competition in the provision of loans in South Africa between 2008 and 2022. To proxy competition, we estimate Lerner Indices for 6 South African banks for the provision of loans. The estimates are obtained through the use of accounting data, as well as the estimation of a multi-output translog cost function to estimate the marginal costs of providing a

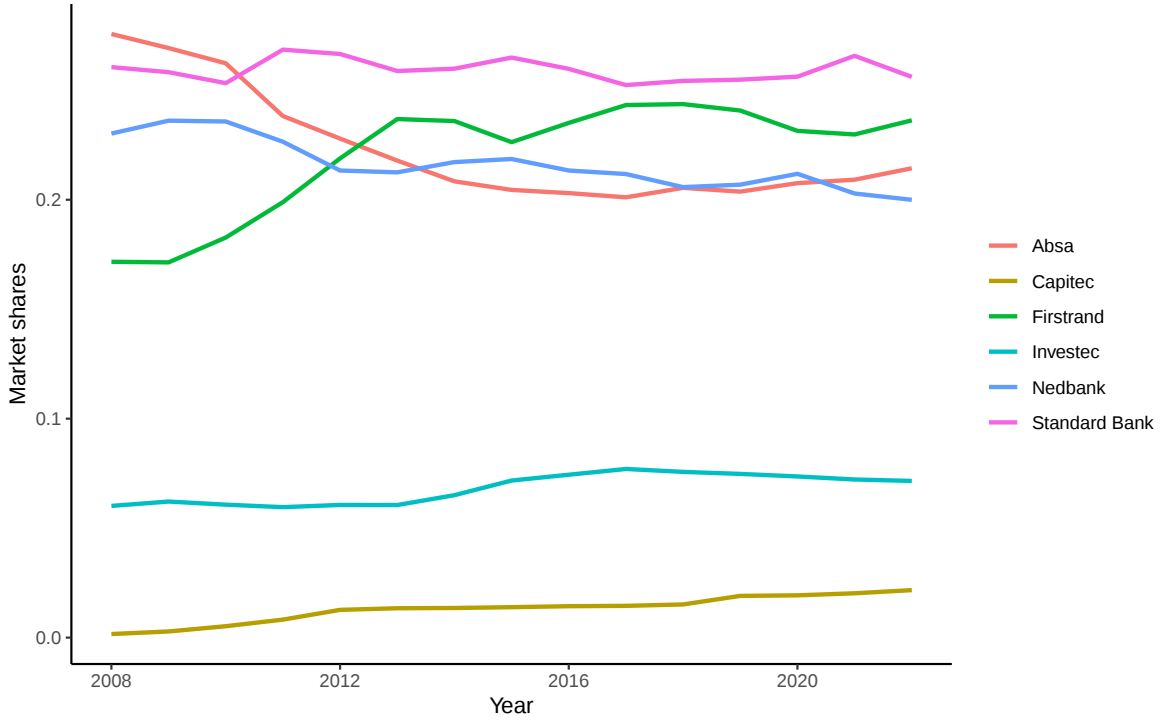


Figure 4: Bank shares of the value of loans issued, 2008-2022

loan. We infer that consistently lower index values provide evidence of a reduced ability to price above marginal costs, which occur on account of greater competition. We also construct a loan-weighted Lerner Index to approximate national market power and competition. We contrast our estimated market power values with HHI values, a structural measure of competition, to assess the differences in the values of these two measures.

We find that on average South African banks have high market power in the provision of loans between 2008 and 2022. However, the national estimates of market power indicate a general decline in this average market power. This general decline does not apply to all banks as bank-specific Lerner Index values indicate that half the banks in our sample experienced increases in market power between 2008 and 2022, while the remainder experienced decreases. Capitec and Firststrand experienced the largest increase in market power and Standard Bank experienced the largest losses in market power. The size of Standard Bank's share of the total value of loans, as well as the quantum of their market power losses drive the national estimates of bank competition. This outcome indicates that national estimates of competition must be interpreted with caution. Our estimated HHI measures also exhibit a general decline between 2008 and 2022 indicating reduced bank concentration. Despite this, we find little

correlation between our estimated Lerner Index values and the HHI values indicating that structural measures may not accurately reflect changes in market power.

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Appendix 1 - Construction of variables

Table A1: Input and output variables

Variable	Description	Source of data:
Input prices		
Wage rate	Staff expenses / Total assets	Bank Focus
Interest on borrowed customer funds	Interest expense on customer deposits / Customer deposits	Bank Focus and SARB
Interest on wholesale debt	Interest expense on debt securities / Wholesale debt	Bank Focus and SARB
Price of capital	(Total operating expenses less staff expenses) / Value of property, plant and equipment	Bank Focus
Output variables		
Total assets	Total assets	Bank Focus
Total loans	Gross loans and advances to customers	Bank Focus
Investment income	Interest income and preferred stock dividends on securities plus dividend income	Bank Focus
Off-balance sheet income	Fee and commission income	Bank Focus
Interest earned on loans		
Price of bank loans	(Total interest income - Interest income and preferred stock dividends on securities) / Total loans	Bank Focus

Appendix 2 - Translog Cost Function Estimate

Table A2: Translog cost function regression estimates, 2008-2022

	<i>Dependent variable:</i>
	ln(cost)
ln(Total Loans)	2.160*** (0.451)
ln(Investment Income)	0.179 (0.321)
ln(OB Income)	-0.411 (0.992)
0.5 x (ln(Total Loans)) ²	0.039 (0.071)
0.5 x (ln(Investment Income)) ²	-0.023 (0.021)
0.5 x (ln(OB income)) ²	0.129* (0.077)
ln(Total Loans) x ln(Investment Income)	-0.059 (0.038)
ln(Total Loans) x ln(Off-Balance Sheet Income)	-0.126* (0.071)
ln(Investment Income) x ln(Off-Balance Sheet Income)	0.083* (0.043)
ln(Wages)	-0.811* (0.472)
ln(Interest of Wholesale Debt)	-0.062 (0.378)
ln(Interest on Borrowed Customer Funds)	2.979*** (0.495)
0.5 x (ln(Wages)) ²	-0.109* (0.064)
0.5 x (ln(Interest of Wholesale Debt)) ²	0.045** (0.018)
0.5 x (ln(Interest on Borrowed Customer Funds)) ²	-0.029 (0.105)
ln(Wages) x ln(Interest of Wholesale Debt)	-0.014 (0.012)
ln(Wages) x ln(Interest on Borrowed Customer Funds)	0.077 (0.078)
ln(Interest of Wholesale Debt) x ln(Interest on Borrowed Customer Funds)	-0.004 (0.028)
ln(Total Loans) x ln(Wages)	-0.092** (0.045)
ln(Total Loans) x ln(Interest of Wholesale Debt)	-0.020 (0.013)
ln(Total Loans) x ln(Interest on Borrowed Customer Funds)	0.050 (0.031)
ln(Investment Income) x ln(Wages)	-0.084* (0.045)
ln(Investment Income) x ln(Interest of Wholesale Debt)	-0.020 (0.014)
ln(Investment Income) x ln(Interest on Borrowed Customer Funds)	0.134*** (0.049)
ln(Off-Balance Sheet Income) x ln(Wages)	0.238*** (0.060)
ln(Off-Balance Sheet Income) x ln(Interest of Wholesale Debt)	0.058** (0.028)
ln(Off-Balance Sheet Income) x ln(Interest on Borrowed Customer Funds)	-0.318*** (0.103)
Bank Fixed Effects	Yes
Time Fixed Effects	Yes
Observations	90
R ²	0.99768
Adjusted R ²	0.9952
F-statistic	685.74*** (df = 27; 43)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Appendix 3 - Bank Lerner Index Estimates

Table A3: Loan product Lerner Index Estimates by bank

Year	Absa	Firststrand	Nedbank	Standard.Bank	Capitec	Investec
2008	0.650	0.675	0.598	0.884	0.317	0.520
2009	0.603	0.719	0.599	0.816	0.569	0.345
2010	0.632	0.688	0.606	0.745	0.597	0.257
2011	0.680	0.680	0.642	0.731	0.591	0.258
2012	0.686	0.661	0.658	0.728	0.635	0.220
2013	0.582	0.611	0.659	0.734	0.720	0.275
2014	0.675	0.656	0.654	0.728	0.768	0.240
2015	0.662	0.723	0.648	0.714	0.794	0.249
2016	0.713	0.735	0.675	0.729	0.834	0.280
2017	0.674	0.741	0.639	0.568	0.800	0.362
2018	0.665	0.791	0.632	0.646	0.797	0.377
2019	0.669	0.822	0.652	0.636	0.800	0.381
2020	0.630	0.827	0.609	0.533	0.816	0.395
2021	0.638	0.825	0.616	0.538	0.894	0.421
2022	0.648	0.818	0.636	0.577	0.774	0.410
2022 - 2008	-0.002	0.143	0.038	-0.307	0.457	-0.110

Appendix 4 - National Lerner Index Estimates

Table A4: Weighted average Lerner Index estimates and the Herfindahl-Hirschman Index, 2008-2022

Year	Weighted Lerner Index	HHI
2008	0.695	0.230
2009	0.661	0.228
2010	0.642	0.226
2011	0.659	0.223
2012	0.657	0.220
2013	0.628	0.220
2014	0.653	0.218
2015	0.659	0.216
2016	0.684	0.215
2017	0.634	0.214
2018	0.664	0.215
2019	0.675	0.213
2020	0.632	0.213
2021	0.639	0.214
2022	0.653	0.213
2022 - 2008	-0.042	-0.017