South African Reserve Bank

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WP/24/08

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16 April 2024

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Financial inclusion and banking sector competition in South Africa

Tendai Gwatidzo[*] and Witness Simbanegavi[†]

Abstract

Using survey data from the World Bank's Global Findex Database and a pseudo panel we investigate two pertinent issues pertaining to financial inclusion in South Africa. First, we consider the factors driving the likelihood of accessing financial services in South Africa. Second, we investigate the impact of banking sector competition on financial inclusion in South Africa – essentially testing the information and market power hypotheses. Household head characteristics such as age, education and income are found to positively influence the likelihood of being financially included. Considering the relationship between financial inclusion and banking sector competition, evidence supports the information hypothesis rather than the market power hypothesis. That is, lower bank competition facilitates the formation of longer-lasting relationships between banks and their clients, which incentivises banks to invest in information generation and monitoring in previously unserved markets, thereby expanding financial inclusion.

JEL classification

D43, G21, G38, L13

Key words

Financial inclusion, bank competition, banking sector, information hypothesis, market power hypothesis

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1. Introduction

Financial development plays an important role in economic growth and poverty reduction (see Demirgüç-Kunt and Maksimovic (1998); Greenwood and Jovanovic (1990); King and Levine (1993); Omar and Inaba (2020); Ibrahim and Alagidede (2018); and Yang (2019)). This role can be enhanced by increasing financial inclusion and banking sector competition (Chauvet and Jacolin 2017).[1] Financial inclusion improves the quality of financial development, thereby magnifying the effect of financial development on economic growth and reducing the extreme vulnerability of the poor to risks and adverse shocks (Beck, Senbet and Simbanegavi 2015; Aaron 2018). Likewise, by engendering more competitive prices and product variety, increased banking sector competition can enhance financial inclusion.

South Africa has the most developed and sophisticated financial sector on the African continent.[2] Over 30 commercial banks and a few mutual banks operate in the country (see Rapapali and Simbanegavi (2020) for a detailed discussion of the South African banking sector). South Africa's banking industry is dominated by five large banks, which together account for more than 90% of the industry's total assets.[3] When measured by the share of the population with a bank account, the country boasts the highest level of financial inclusion in Africa (World Bank 2022b). According to the World Bank's Global Findex Database (World Bank 2022a), the proportion of South Africans aged 15 years and older with a bank account increased from 54% in 2011 to more than 85% in 2021 (see Figure 1). The average for sub-Saharan Africa in 2021 was only 55% (World Bank 2022a).[4]

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[1] Financial inclusion is defined as access by enterprises and households to reasonably priced and appropriate formal financial services that meet their needs (Beck, Senbet and Simbanegavi 2015).

[2] Financial development is typically measured by the following indicators: domestic credit to private sector as a percentage of GDP; ratio of stock market capitalisation to gross domestic product (GDP); stock market turnover ratio; and ratio of liquid liabilities (M2) to GDP (Beck, Senbet and Simbanegavi 2015).

[3] The four largest banks (Standard Bank, Absa, Nedbank and First National Bank) each control roughly a fifth of the market, and this position has changed little over the past two decades despite new entrants. The four-firm concentration ratios for deposits and loans were 92.6% and 92.7% respectively in 2008, declining slightly to 88% and 88.9% respectively in 2018 (Rapapali and Simbanegavi 2020).

[4] Figure 1 suggests there are no significant differences in the adoption of financial products by men and women in the country.

Figure 1: Percentage of South Africans aged over 15 years with a bank account (2011–2021)
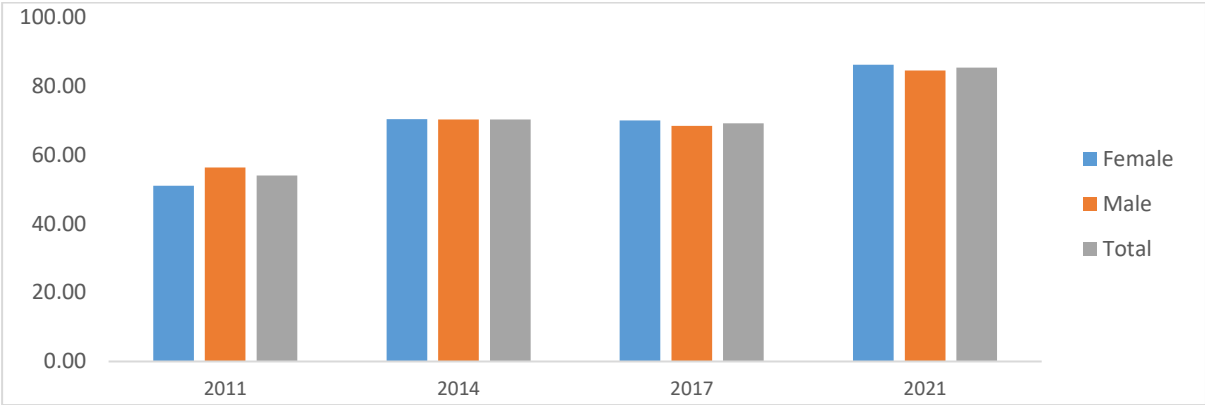
Source: World Bank Global Findex Database

With respect to other indicators of financial inclusion as well as banking costs faced by consumers, South Africa does not measure satisfactorily against emerging market peers. It scores poorly when financial inclusion is measured by access to credit cards: about 13% of adults in South Africa have a credit card, compared with 32% in Brazil, 21% in Russia and 18% in Mexico (World Economic Forum 2017). South Africa's low credit card access relative to emerging market peers perhaps reflects the high levels of poverty in the country, with more than 30 million people living below the national poverty line (World Bank 2020). Together with relatively high banking costs of 0.4% of gross national income per capita (Figure 2), this may underpin the limited access to, and usage of, formal financial services by South African households (Matsebula and Yu, 2010).

Figure 2: Average banking fees (as a percentage of gross national income per capita)
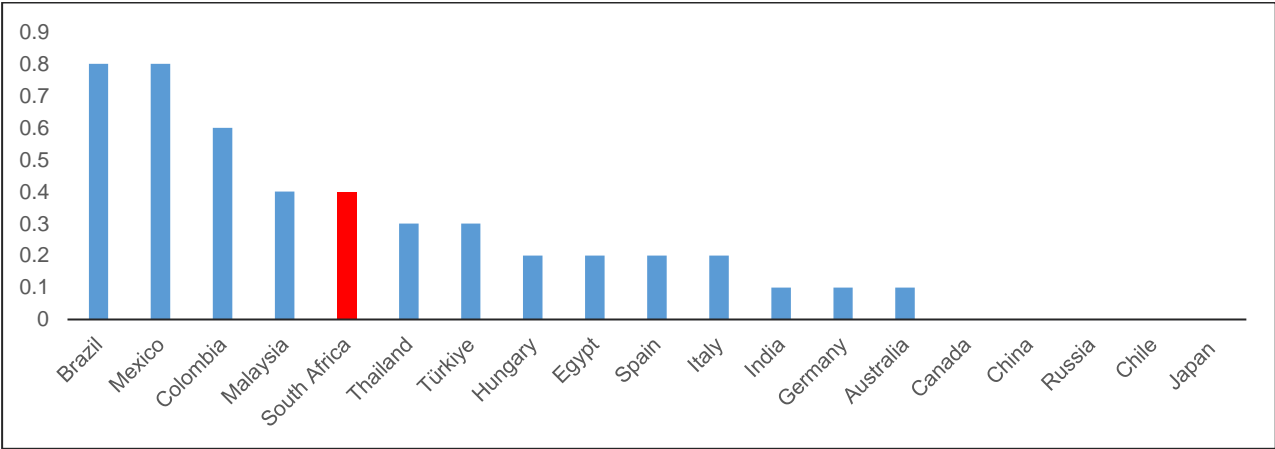
Source: World Economic Forum (2017)

Focusing on the adoption of financial products is a narrow way of viewing financial inclusion. Financial inclusion speaks to the availability, affordability, usage and appropriateness of financial services (Beck, Senbet and Simbanegavi 2015). For example, although the proportion of adults with a transaction account in South Africa is quite high, the average number of transactions by account holders is as low as three transactions per month (World Bank 2013). Looked at in this way, financial inclusion in South Africa remains a pressing policy challenge.

Indeed, the South African government's policy efforts over the past two decades suggest that it is cognisant of this deficiency (see National Treasury (2023)). Through the National Treasury, the South African Reserve Bank (SARB) and other stakeholders, government has introduced several initiatives, such as the Financial Sector Charter and the Financial Sector Code of 2012, to stimulate and promote financial inclusion in the country.[5] Led by the country's four largest commercial banks and the Post Office bank (Postbank), in 2004 the banking sector introduced the Mzansi Account (see National Treasury (2023)), a transactional account intended to provide banking services to the country's poor and unbanked at a low cost (World Bank 2016, 2018). In addition, the government's shift from cash to electronic payments to pay social grants (via South African Social Security Agency gold cards) also significantly increased the number of financially included people. Other policy efforts to deepen South Africa's financial sector have included promoting entry into the banking market to bolster competition, which led to new banks such as Bank Zero and TymeBank entering the market over the past decade.

This study investigates the relationship between bank competition and financial inclusion in South Africa. This is an important topic of study, as a better understanding of this relationship can facilitate the development of tailored policies that drive financial inclusion and inclusive growth.[6] We proceed in two steps. First, we assess the extent of competition in the South African banking sector using the Boone indicator, the Lerner

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[5]   The Financial Sector Charter was introduced in 2004 and was replaced by the more binding Financial Sector Code in 2012.

[6]   A holistic view of financial inclusion requires it to be looked at from three important angles: supply (what is being provided by financial institutions such as banks), demand (what consumers want and the constraints they face) and the policy environment (how institutions like the SARB promote financial inclusion).

index and the five-bank concentration ratio (CR5). Using multiple competition measures reduces the likelihood of the findings being driven by the peculiarities of a given competition indicator and improves robustness. Second, we investigate the nexus between banking sector competition and financial inclusion in South Africa, attempting to answer the question: Does the degree of competition inform financial inclusion in South Africa?

Our study contributes to the literature in various ways. Most studies on the link between financial inclusion and banking sector competition use panel regressions where several countries are included in the sample. While this may increase the number of observations and thus the precision with which parameters are estimated, it masks features that can be more clearly unpacked and better understood at the country level. Country-level studies may provide a better understanding of the important causal pathways that link certain events (or shocks) to outcomes (Cunningham 2021). In single-country studies, it is also easier to find natural experiments that help address identification problems (Black et al. 2014). Moreover, because countries are not homogeneous, they may not be uniformly affected by common shocks such as the global financial crisis or the COVID-19 pandemic. A failure to control for such shocks has material implications for outcomes.[7] As a single-country study, our study circumvents most of these challenges.

The study closest to ours is Mengistu and Perez-Saiz (2018), who examine the relationship between bank competition and financial inclusion using a panel of sub-Saharan countries. However, it is unclear from their study how the panel was created, as the World Bank's Global Findex survey did not necessarily follow the same individuals, moving from the 2011 to 2014 waves. Our study seeks to improve on this by creating a pseudo panel.[8] We also consider three waves of data (2011, 2014 and 2017) rather than Mengistu and Perez-Saiz's two.

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[7] For example, studies by Pham, Nguyen and Nguyen (2019) and Owen and Pereira (2018) consider non-homogeneous countries in the panel and consider periods that span the global financial crisis.

[8] In the absence of a true panel data set one can use repeated cross-sectional data to create pseudo panels that observe cohorts over time (Deaton 1985; Guillerm 2017).

We find that competition in the South African banking sector has generally increased since the early 2000s. In terms of the determinants of access to financial services, household head characteristics such as age, education and income were found to be important determinants that positively influence the likelihood of financial inclusion. We also find evidence that supports the importance of the information hypothesis over the market power hypothesis in the relationship between financial inclusion and banking sector competition. In particular, we find a negative relationship between bank competition and financial inclusion.

The paper is organised as follows: section 2 reviews the theoretical and empirical literature on bank competition and financial access, while section 3 discusses data and the framework for assessing bank competition. Section 4 presents the main methodology of the paper and the estimation results. Section 5 concludes the study.

2. Literature review

Prior research considered the role that banking sector competition plays in relation to financial inclusion and the deepening of the financial sector more generally. Below, we present a brief literature survey of this relationship, focusing on arguments for and findings relating to the market power and information hypotheses.

2.1 Theoretical framework – the market power and information hypotheses

From a theoretical point of view, there are multiple possibilities regarding the relationship between banking sector competition and financial inclusion. These possible outcomes are summarised in two hypotheses: the market power hypothesis and the information hypothesis. The market power hypothesis posits a positive relationship between competition and financial inclusion (Love and Peria 2015; Petersen and Rajan 1995; Pham, Nguyen and Nguyen 2019). Banking markets that suffer from low competition may provide weak incentives for market development, with banks contending with cream-skimming (catering only for the top income segments). When facing increased competition, however, banks are pushed to innovate, offering tailored financial services to existing and prospective customers (see Mengistu and Perez-Saiz (2018)). This is because banking sector competition, by reducing profit margins for banks, not only forces banks to be more efficient (in terms of both allocative

and productive efficiency) but also encourages them to expand both product offerings and clientele (Love and Peria 2015; Pham et al. 2019).

The information hypothesis, on the other hand, posits a negative relationship between banking sector competition and financial inclusion. The high information asymmetry between banks and borrowers creates problems of adverse selection and moral hazard (Love and Peria 2015; Petersen and Rajan 1995; Pham, Nguyen and Nguyen 2019), requiring banks to expend resources on monitoring and information gathering – ex-ante as well as ex-post – to reduce the asymmetry. According to the information hypothesis, banks are more likely to invest in monitoring and information collection if they foresee a longer-term relationship with borrowers/clients.[9] This suggests that banks with more market power (less competition) will tend to invest more in monitoring and information collection, enabling them to increase their services and products to more borrowers. Hence, more market power enhances financial inclusion. Linked to this thesis is the argument that by allowing for supra-normal profits, market power provides the resources needed both to undertake monitoring and information gathering and to innovate and develop products tailored to different market segments.

2.2 Empirical evidence on the relationship between bank competition and financial inclusion

Empirical evidence on the relationship between banking sector competition and financial inclusion is also mixed. Studies by Mengistu and Perez-Saiz (2018), Pham, Nguyen and Nguyen (2019), Marin and Schwabe (2019), Love and Peria (2015) and others find that banking sector competition enhances financial inclusion and access to finance. Mengistu and Perez-Saiz (2018) used the World Bank's Global Financial Inclusion Database's 2011 and 2014 individual-level survey data and competition measures from the Global Financial Development Database to investigate the relationship between banking sector competition and financial inclusion. The study, which covered sub-Saharan countries (including South Africa), found that banking sector competition enhances financial inclusion, corroborating Marin and Schwabe's (2019) findings on Mexico. Pham, Nguyen and Nguyen (2019), who used a sample of

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9   Increased competition increases the probability that borrowers will move to other banks (Love and Peria 2015; Petersen and Rajan 1995).

93 countries (covering the period 2000–2014), also found that banking sector competition enhances financial inclusion. These findings are corroborated by Love and Peria (2015), who concluded that banking sector competition increased firm access to finance.[10]

However, other studies have found that banking sector competition reduces financial inclusion, access to finance and the general usage of external finance. Using the generalised method of moment (GMM) approach and panel data from 83 countries, Owen and Pereira (2018) find that high bank market power (increased bank concentration) spurs financial inclusion in a contestable market. In Petersen and Rajan (1995) and Fischer (2000) the concentration ratio was used as a measure of competition, and a negative relationship between bank competition and access to finance was found. Zarutskie (2006) also finds that increased banking sector competition results in less bank lending to firms (particularly younger firms).

Given the disagreement in the literature, the relationship between bank competition and financial inclusion in any given country is an empirical matter. This study thus explores this question for South Africa.

3. Methodology and data

3.1 Data and methods used to measure bank competition

The data used for the study are from various sources, namely the BankFocus database, the World Development Indicators database and the World Bank's Global Findex Database. Bank-level data are from the BankFocus database, one of the premier sources of financial data offering standardised information, which is helpful when comparing results with studies based on other countries. The World Bank's Global Findex Database covers more than 140 countries and has detailed information on financial inclusion for several countries, including South Africa. Its nationally

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[10]   Love and Peria (2015) used the World Bank Enterprise Survey data covering 53 countries over the period 2002 to 2010. Other relevant studies include Liu, Lirzaei and Vandoros (2014), who find that increased concentration increases industry growth; Liebersohn (2017) and Rice and Strahan (2010), who find that increased bank competition increase lending; and Liu and Li (2022), who find that increased competition stimulates total factor productivity.

representative surveys cover adults aged 15 years and older and were conducted in 2011, 2014, 2017 and 2021. Most questions asked over these years are the same, although the 2017 and 2021 waves have more questions. The macro variables used were obtained from the World Development Indicators online database. Table A1 in the annexure describes the variables used in the study, while Table A2 presents summary statistics. Table A3 presents the correlation matrix when using 2017 Survey data.

For bank competition measures we consider the Boone indicator, the Lerner index and the CR5. These different measures have distinct strengths and weaknesses, and no single measure can provide a full picture of banking sector competition. For example, unlike structural competition measures such as the concentration ratio, the Lerner index is based on the standard oligopoly theory and has the advantage that it has higher discriminating power (Leon 2014a). The Lerner index is one of the so-called first generation new empirical industrial organisation (NEIO) models. One weakness of these models, however, is that they do not typically emphasise non-pricing strategies, as is done by second generation NEIO models (Leon 2014b).[11] Below, we briefly discuss the Boone indicator, the Lerner index and the CR5.

The Boone indicator

The Boone indicator measures bank profit responsiveness to changes in marginal cost. It is based on the idea that banks get punished for being inefficient (Boone 2008). This punishment manifests through lower profits or higher losses. That is, inefficient banks tend to be severely or harshly penalised in more competitive environments (Degryse, Kim and Ongena 2009). While the Boone indicator may not allow for the categorisation of banking sectors into various market structures (such as perfect competition, monopolistic competition, oligopoly and pure monopoly), an increase in its absolute value can be unambiguously interpreted as an indication of increased competition. The Boone indicator is simple and easy to estimate, as its data requirements are minimal. It has been used to assess the extent of banking sector competition in the extant

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[11] Banks/firms selling differentiated products often engage in non-price competition such as advertising or quality. In such cases, price competition may understate the degree of competition in the market. The Boone indicator falls in the second generation NEIO models category.

literature (see Van Leuvensteijn (2008) and Rapapali and Simbanegavi (2020)). According to Boone (2008), profit elasticity, which reflects the degree of competition, can be measured as follows:

$$\ln \Pi_i = \alpha - \beta \ln(MC_i) + \text{error term} \tag{1}$$

where Π_i stands for bank i's profit and MC_i is bank i's marginal cost. The parameter of interest, β, measures the profit elasticity.[12] We use data from BankFocus from 2005 to 2019 to estimate the Boone indicator. We measure profit using return on assets (ROA). In line with the extant literature, we estimate the marginal cost in two steps: in the first step we estimate the total cost function using the translog cost formulation (Titotto and Ongena 2017), and in the second, we estimate the marginal cost as a partial derivative of the estimated translog cost function with respect to output (see Table A4 in the annexure).

The Lerner index

The Lerner index measures the gap between price and marginal cost, with a larger gap indicating a higher degree of market power and vice versa.[13] It is considered to be a direct measure of market power (Lerner 1934; Leon 2014a) and is estimated as follows:

$$Lerner\ index = \frac{P_i - MC_i}{P_i} \tag{2}$$

where P is the price of banking products and MC is the marginal cost. P is proxied by the ratio of total revenue to total assets (Weill 2013; Simbanegavi, Greenberg and Gwatidzo 2015). Total assets here serve as a proxy for bank output, while the marginal cost is calculated using the translog cost function.

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[12]   Others in the literature have used market share as a dependent variable (see Rapapali and Simbanegavi (2020) and references therein).

[13]   Studies that have used the Lerner index to measure competition in the banking sector include Ariss (2010), Berger, Klapper and Turk-Ariss (2009), Weill (2013) and Maudos and de Guevara (2007).

The concentration ratio

Although the concentration ratio has obvious weaknesses as a measure of competition, we use it here to supplement the above measures of competition. We consider the CR5, measured as the market share held by the top five banks. An increase in this ratio indicates greater market influence by the top five banks, which in turn suggests increased market power (reduced competition). The CR5 is calculated as follows:

$$CR5 = \frac{\sum_{i=1}^{5} total\ assets_i}{total\ banking\ industry\ assets} \qquad (3)$$

3.2 Results for the extent of banking sector competition in South Africa

The results based on the Boone indicator and the Lerner index are presented in Figures 3 and 4 respectively.[14] To simplify interpretation, we look at the absolute values of the Boone indicator. Figure 3 shows that the Boone Indicator was quite volatile between 2005 and 2019. However, between 2010 and 2019 there was a general increase in the absolute values of the Boone indicator, indicating an intensification of competition in the banking sector over this period. The Boone indicator results are largely mirrored by the Lerner index findings (Figure 4), which show a decrease in banking sector competition in South Africa over the 2005–2009 period, followed by a period of gradual increase between 2010 and 2019.

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[14]   While the measures are calculated at bank level, the reported indicators are at industry level. The industry-level indicators are also used in the regression models.

Figure 3: Boone indicator for South African commercial banks (2005–2019)
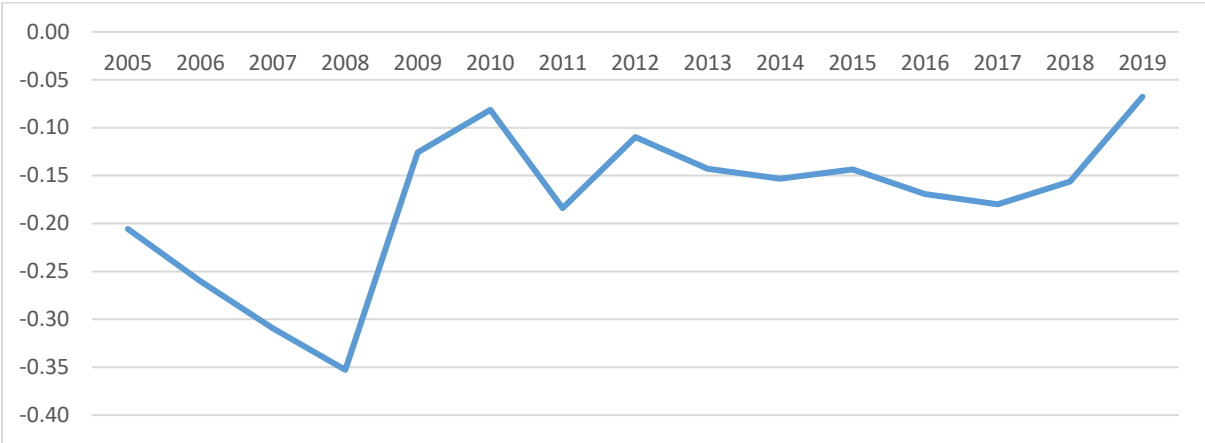
Source: Own calculations from BankFocus database

Figure 4: Lerner index for South African commercial banks (2005–2019)
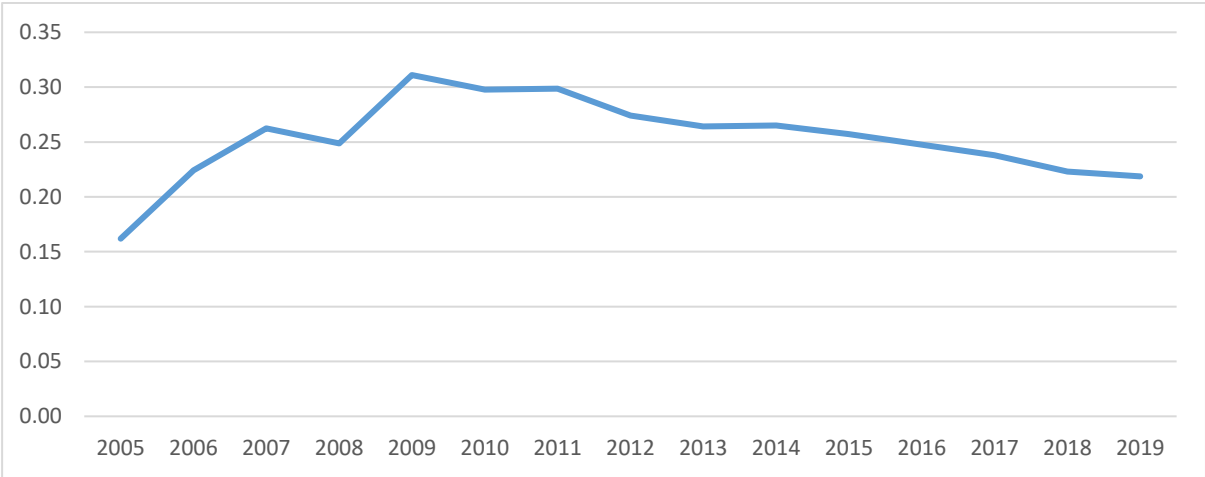
Source: Own calculations from BankFocus database

4. The impact of banking sector competition on financial inclusion

4.1 Empirical model

The main objective of this study is to investigate the relationship between banking sector competition and financial inclusion (the adoption of financial products) in South Africa. We measure financial inclusion using two indicators: the adoption of banking accounts and the adoption of debit cards. To measure the adoption of banking accounts, we use a narrow indicator that considers only the adoption of commercial bank accounts, and a broader measure that allows for any of the following banking accounts: commercial bank account, a post office account or an account with a microfinance institution. We use the Findex Data focusing on South African individuals surveyed during the years 2011, 2014 and 2017 to create cohorts based on age and

gender, taking advantage of the fact that gender and year of birth do not change over time. This allows us to follow cohorts over time – a pseudo panel.

Our analysis proceeds in two steps. First, we estimate a simple probit model on whether demographic characteristics affect the likelihood of being financially included. This is followed by an assessment of the relationship between banking sector competition and financial inclusion. To answer the question on the covariates of financial inclusion (FI) we estimate the following probit model:

Prob(FI) = f(age, age squared, gender, education, income level, employment)   (4)

To answer the question on the impact of banking sector competition on financial inclusion, we follow Mengistu and Perez-Saiz (2018) and assume that $\Pr(y_{ct} = 1) = \Pr(y_{ct}^* > 0)$, where:

$$y_{ct}^* = \alpha_0 + \alpha_1 competition_t + \alpha_2 X_{ct} + \varepsilon_{ct} \qquad (5)$$

The variable y_{ct} measures the outcome of interest (financial inclusion), where c denotes the cohort and t denotes time. The variable y_{ct} takes a value of 1 if the individual is financially included and 0 otherwise.[15] y_{ct}^* is a latent variable.

An individual is financially included if he/she has an account with a financial institution, or has a debit card, or (more broadly) has an account at a financial institution, post office or micro-finance institution. The explanatory variable *competition* is our variable of interest, and we are especially interested in its coefficient (α_1). This study seeks to test the market power and the information hypotheses to assess which dominates the South African banking sector. X_{ct} denotes the various control variables used (age, gender, education, income levels and private credit), and ε_{ct} is the error term.

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[15]   To simplify things, we run a simple linear probability model using the generated pseudo panel. Despite the limitations of linear probability models, we are especially interested in the direction of causality rather than the exact quantitative impact of bank competition on financial inclusion. One limitation is that the predicted probabilities may fall outside the 0 to 1 range.

The market power hypothesis postulates a positive relationship between banking sector competition and the adoption of financial products, while the information hypothesis postulates a negative relationship. Competition is measured using the Boone indicator, the Lerner index and the CR5, although an increase in any one of these indicators does not necessarily imply an increase in competition. For instance, an increase in the CR5 or the Lerner index implies a reduction in competition, while an increase in the absolute value of the Boone indicator implies an increase in competition. A positive CR5 or Lerner index coefficient thus implies a negative relationship between competition and financial inclusion, and vice versa. However, a positive Boone indicator coefficient implies a positive relationship between bank competition and financial inclusion. This implies that to find a positive effect of banking sector competition on financial inclusion (in line with the market power hypothesis), one would expect the estimated coefficients for the CR5 and Lerner index to be negative and that of the Boone indicator to be positive. The reverse is true for the information hypothesis.

4.2 Results on the relationship between financial inclusion and demographic characteristics

We start by looking at the correlation between financial inclusion and individual characteristics – namely age, gender, education and income level. For this we run cross-section regressions for each survey year. Tables 1, 2 and 3 show the results based on the 2011, 2014 and 2017 survey data respectively. The results show that age is positively and significantly related to the likelihood of being financially included. This means that older people (who are likely to be active participants in the labour market) are more likely to be financially included. However, the magnitude of the impact differs across survey years, consistently declining from 2011 to 2017. For example, a unit increase in age increases the predicted probability of financial inclusion by about 30% when using 2011 survey data, but using the 2014 and 2017 survey data drops the impact by about 2% (see Table A5, which shows the average marginal effects). The negative and significant coefficient for the age squared variable, however, indicates that the relationship between age and financial inclusion is not monotonic; there is a threshold beyond which further increases in age reduce financial inclusion.

Education and income levels are also found to be important drivers of financial inclusion: higher levels of education and income tend to increase the likelihood of being financially included. For example, completing secondary education increases the probability of financial inclusion by between 10% and 25% (see Table A5) relative to completing only primary-level education. The change from quintile 1 to quintile 3 increases the probability of financial inclusion by between 10% and 14%, regardless of the measure of financial inclusion used (see Table A5). This implies that the less educated and the poor are less likely to be financially included, which may reflect diminished income-earning opportunities or perceived higher banking transaction costs among less educated or poor South Africans. We also found that men and women with similar attributes are equally likely to be financially included.[16] The results are robust to various measures of financial inclusion and are consistent across the three waves.

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[16]   However, we did not specifically investigate the possibility of gender discrimination when it comes to women's access to financial services.

Table 1: Probit results on the determinants of financial inclusion (based on 2011 survey data)

Variables	Bank account	General account	Debit card
Age	0.080***	0.075***	0.076***
	(0.02)	(0.02)	(0.02)
Age squared	-0.001***	-0.001***	-0.001***
	(0.00)	(0.00)	(0.00)
Gender	0.052	0.036	0.146*
	(0.09)	(0.09)	(0.09)
Secondary	0.601***	0.558***	0.511***
	(0.11)	(0.11)	(0.11)
Tertiary	1.330***	1.459***	0.806***
	(0.21)	(0.23)	(0.18)
Quintile 2	0.219	0.217	0.180
	(0.15)	(0.15)	(0.15)
Quintile 3	0.333**	0.385***	0.180
	(0.14)	(0.14)	(0.14)
Quintile 4	0.587***	0.620***	0.333**
	(0.14)	(0.14)	(0.14)
Quintile 5	0.987***	1.057***	0.916***
	(0.14)	(0.15)	(0.14)
Constant	-2.364***	-2.212***	-2.308***
	(0.34)	(0.33)	(0.33)
Observations	1 000	1 000	1 000
Pseudo R-squared	0.149	0.153	0.121
Log pseudolikelihood	-582.2	-572.6	-609.1
Wald chi-squared	175.4***	171.6***	152.9***

Note: *, ** and *** stand for 10%, 5% and 1% levels of significance respectively; robust standard errors are in parentheses. Primary and Quintile 1 are the reference categories.

Table 2: Probit results on the determinants of financial inclusion (based on 2014 survey data)

Variables	Bank account	General account	Debit card
Age	0.062***	0.063***	0.054***
	(0.01)	(0.01)	(0.01)
Age squared	-0.000***	-0.000***	-0.000***
	(0.00)	(0.00)	(0.00)
Gender	-0.046	-0.040	-0.001
	(0.09)	(0.09)	(0.09)
Secondary	0.584***	0.607***	0.659***
	(0.12)	(0.12)	(0.12)
Tertiary	1.001***	1.025***	1.499***
	(0.21)	(0.22)	(0.22)
Quintile 2	0.047	0.028	0.105
	(0.14)	(0.14)	(0.14)
Quintile 3	0.455***	0.448***	0.409***
	(0.15)	(0.15)	(0.15)
Quintile 4	0.569***	0.591***	0.657***
	(0.14)	(0.15)	(0.14)
Quintile 5	0.768***	0.767***	0.833***
	(0.15)	(0.15)	(0.14)
Constant	-1.756***	-1.742***	-1.976***
	(0.31)	(0.31)	(0.30)
Observations	999	999	990
Pseudo R-squared	0.124	0.127	0.140
Log pseudolikelihood	-516.5	-502.5	-564.6
Wald chi-squared	123.0***	123.2***	150.5***

Note: *, ** and *** stand for 10%, 5% and 1% levels of significance respectively; robust standard errors are in parentheses. Primary and Quintile 1 are the reference categories.

Table 3: Probit results on the determinants of financial inclusion (based on 2017 survey data)

Variables	Bank account	General account	Debit card
Age	0.012	0.011	0.045***
	(0.01)	(0.01)	(0.02)
Age squared	-0.000	0.000	-0.000**
	(0.00)	(0.00)	(0.00)
Gender	-0.132	-0.127	0.096
	(0.09)	(0.09)	(0.09)
Secondary	0.316**	0.284**	0.335***
	(0.13)	(0.13)	(0.13)
Tertiary	0.753***	0.682***	0.787***
	(0.21)	(0.21)	(0.19)
Quintile 2	0.184	0.223	0.299*
	(0.15)	(0.15)	(0.15)
Quintile 3	0.223	0.269*	0.307**
	(0.14)	(0.14)	(0.15)
Quintile 4	0.196	0.221	0.324**
	(0.14)	(0.14)	(0.15)
Quintile 5	0.410***	0.410***	0.648***
	(0.14)	(0.14)	(0.14)
Employed	0.402***	0.396***	0.201**
	(0.09)	(0.09)	(0.10)
Constant	-0.628**	-0.557*	-2.094***
	(0.31)	(0.31)	(0.32)
Observations	999	999	970
Pseudo R-squared	0.0473	0.0442	0.0600
Log pseudolikelihood	-594.7	-583.5	-604.3
Wald chi-squared	55.08***	50.73***	74.71***

Note: *, ** and *** stand for 10%, 5% and 1% levels of significance respectively; robust standard errors are in parentheses. Primary and Quintile 1 are the reference categories.

4.3 Results on the relationship between banking sector competition and financial inclusion

To assess the relationship between banking sector competition and financial inclusion in South Africa, we estimated both the random effects model (REM) and the fixed effects model (FEM).[17] Tables 4 and 5 present the REM and FEM results respectively. The dependent variable is measured using three proxies: the adoption of a commercial bank account; the adoption of an account at a bank, post office or microfinance institution; and the adoption of a debit card. As previously discussed, if the effect of banking sector competition on financial inclusion is positive (in line with the market

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[17] Variables such as gender that do not change over time are dropped by the FEM, hence our decision to run both models.

power hypothesis), we expect the estimated coefficient to be negative for the Lerner index and the CR5 and to be positive for the Boone indicator. However, if the effect of banking sector competition on financial inclusion is negative (in line with the information hypothesis), we expect the estimated coefficients to be positive for the Lerner index and the CR5 and to be negative for the Boone indicator.

Table 4 shows that the estimated coefficients for the Lerner index and the CR5 were both positive and significant at the 1% level, while the coefficients for the Boone indicator were all negative and significant. This implies that a unit increase in the Lerner index (decrease in competition) increases the predicted probability of financial inclusion by between 2 and 3 units regardless of the financial inclusion measure used. A unit increase in the CR5 (decrease in competition) increases the predicted probability of financial inclusion by between 0.31 and 1.42 units (see Table 4), while a unit increase in the Boone indicator (increase in bank competition) decreases the predicted probability of financial inclusion by between 3.0 and 4.1 units. The results, which corroborate findings by Mengistu and Perez-Saiz (2018), Pham, Nguyen and Nguyen (2019) and Love and Peria (2015), imply a negative relationship between banking sector competition and financial inclusion. This suggests that South African banks' behaviour is consistent with the information hypothesis rather than the market power hypothesis. Similar results were confirmed by the FEM (see Table 5).

With respect to the control variables, we find a positive and significant relationship between age and account adoption, indicating that older people are more likely to be financially included than younger people. This finding is consistent with the high youth unemployment rates in South Africa and reveals that young people face the twin challenges of limited access to both the labour market and financial services. Education was also found to play a role in financial inclusion: those with secondary and tertiary qualifications are more likely to be financially included than those with only a primary level of education. This may reflect the impact of financial literacy and access to the labour market for more educated South Africans. That the youth and the less educated are more likely to be financially excluded is suggestive of cream-skimming by the banks. We find no significant differences between men and women in so far as financial inclusion is concerned, and we find mixed results with respect to the impact of income and private credit on financial inclusion.

Table 4: Panel data results on the impact of banking sector competition on financial inclusion using a random effects model

Variables	Bank account			General bank account			Debit card		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Age	0.012**	0.012**	0.012**	0.013***	0.013***	0.013***	0.015***	0.015***	0.015***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age squared	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000**	-0.000**	-0.000**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Gender	-0.001	-0.001	-0.001	-0.007	-0.007	-0.007	-0.007	-0.007	-0.007
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
Secondary	0.559***	0.559***	0.559***	0.570***	0.570***	0.570***	0.516***	0.516***	0.516***
	(0.16)	(0.16)	(0.16)	(0.15)	(0.15)	(0.15)	(0.12)	(0.12)	(0.12)
Tertiary	0.466***	0.466***	0.466***	0.452***	0.452***	0.452***	0.913***	0.913***	0.913***
	(0.17)	(0.17)	(0.17)	(0.16)	(0.16)	(0.16)	(0.12)	(0.12)	(0.12)
Quintile 2	0.004	0.004	0.004	0.041	0.041	0.041	0.173	0.173	0.173
	(0.17)	(0.17)	(0.17)	(0.16)	(0.16)	(0.16)	(0.12)	(0.12)	(0.12)
Quintile 3	-0.307**	-0.307**	-0.307**	-0.295**	-0.295**	-0.295**	0.224**	0.224**	0.224**
	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.15)	(0.11)	(0.11)	(0.11)
Quintile 4	-0.190	-0.190	-0.190	-0.183	-0.183	-0.183	0.132	0.132	0.132
	(0.14)	(0.14)	(0.14)	(0.13)	(0.13)	(0.13)	(0.10)	(0.10)	(0.10)
Quintile 5	-0.053	-0.053	-0.053	-0.026	-0.026	-0.026	0.325**	0.325**	0.325**
	(0.19)	(0.19)	(0.19)	(0.18)	(0.18)	(0.18)	(0.14)	(0.14)	(0.14)
Private credit	-0.008	-0.033***	0.009**	-0.006	-0.029***	0.008**	-0.028***	-0.046***	-0.016***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Lerner index	2.883***			2.587***			2.122***		
	(0.66)			(0.63)			(0.48)		
Boone indicator		-4.099***			-3.678***			-3.016***	
		(0.93)			(0.90)			(0.68)	
CR5			0.417***			0.374***			0.307***
			(0.09)			(0.09)			(0.07)
Constant	0.491	4.934***	-42.667***	0.325	4.312***	-38.402***	3.079***	6.348***	-28.676***
	(0.69)	(1.50)	(9.46)	(0.66)	(1.45)	(9.10)	(0.50)	(1.09)	(6.85)
Observations	91	91	91	91	91	91	91	91	91
Number of cohorts	32	32	32	32	32	32	32	32	32
Wald chi-squared	71.35***	71.35***	71.35***	72.96***	72.96***	72.96***	188.0***	188.0***	188.0***

Note: Standard errors are in parentheses; *, ** and *** stand for 10%, 5% and 1% levels of significance respectively. *Bank account* is a dummy variable taking a value of 1 if an individual has an account at a financial institution and 0 otherwise. *General bank account* is a dummy variable taking a value of 1 if an individual has an account at a financial institution, post office or microfinance institution (composite indicator) and 0 otherwise. *Debit card* is a dummy variable taking a value of 1 if an individual has a debit card and 0 otherwise. Primary and Quintile 1 are the reference categories. Columns 1–3 show results when using *bank account ownership* as the dependent variable. Columns 4–6 show results when using the ownership of an account at a financial institution, post office or microfinance institution as the dependent variable. Columns 7–9 show results when using *debit card* ownership as the dependent variable.

Table 5: Panel data results on the impact of banking sector competition on financial inclusion using a fixed effects model

Variables	Bank account			General bank account			Debit card		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Age	-0.087	-0.087	-0.087	-0.078	-0.078	-0.078	-0.037	-0.037	-0.037
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)
Age squared	0.001**	0.001**	0.001**	0.000*	0.000*	0.000*	0.000	0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Secondary	0.650***	0.650***	0.650***	0.683***	0.683***	0.683***	0.563***	0.563***	0.563***
	(0.23)	(0.23)	(0.23)	(0.22)	(0.22)	(0.22)	(0.18)	(0.18)	(0.18)
Tertiary	0.245	0.245	0.245	0.267	0.267	0.267	0.874***	0.874***	0.874***
	(0.21)	(0.21)	(0.21)	(0.20)	(0.20)	(0.20)	(0.16)	(0.16)	(0.16)
Quintile 2	0.229	0.229	0.229	0.262	0.262	0.262	0.269	0.269	0.269
	(0.21)	(0.21)	(0.21)	(0.20)	(0.20)	(0.20)	(0.17)	(0.17)	(0.17)
Quintile 3	-0.197	-0.197	-0.197	-0.153	-0.153	-0.153	0.378**	0.378**	0.378**
	(0.21)	(0.21)	(0.21)	(0.20)	(0.20)	(0.20)	(0.16)	(0.16)	(0.16)
Quintile 4	0.064	0.064	0.064	0.061	0.061	0.061	0.190	0.190	0.190
	(0.19)	(0.19)	(0.19)	(0.18)	(0.18)	(0.18)	(0.15)	(0.15)	(0.15)
Quintile 5	0.363	0.363	0.363	0.378	0.378	0.378	0.493**	0.493**	0.493**
	(0.26)	(0.26)	(0.26)	(0.25)	(0.25)	(0.25)	(0.21)	(0.21)	(0.21)
Private credit	-0.003	-0.048**	0.027	-0.002	-0.042**	0.025	-0.025***	-0.054***	-0.006
	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
Lerner index	5.176**			4.629*			3.329*		
	(2.37)			(2.31)			(1.87)		
Boone indicator		-7.357**			-6.580*			-4.732*	
		(3.37)			(3.29)			(2.66)	
CR5			0.748**			0.669*			0.481*
			(0.34)			(0.33)			(0.27)
Constant	2.472	10.448**	-75.002**	2.078	9.211*	-67.210**	4.087***	9.217**	-45.740*
	(1.60)	(5.15)	(34.05)	(1.56)	(5.02)	(33.21)	(1.26)	(4.06)	(26.87)
Observations	91	91	91	91	91	91	91	91	91
R-squared	0.556	0.556	0.556	0.546	0.546	0.546	0.679	0.679	0.679
Number of cohorts	32	32	32	32	32	32	32	32	32
F-statistic	6.12***	6.12***	6.12***	5.90***	5.90***	5.90***	10.35***	10.35***	10.35***

Note: Standard errors are in parentheses; *, ** and *** stand for 10%, 5% and 1% levels of significance respectively. *Bank account* is a dummy variable taking a value of 1 if an individual has an account at a financial institution and 0 otherwise. *General bank account* is a dummy variable taking a value of 1 if an individual has an account at a financial institution, post office or microfinance institution (composite indicator) and 0 otherwise. *Debit card* is a dummy variable taking a value of 1 if an individual has a debit card and 0 otherwise. Primary and Quintile 1 are the reference categories. Columns 1–3 show results when using *bank account ownership* as the dependent variable. Columns 4–6 show results when using the ownership of an account at a financial institution, post office or microfinance institution as the dependent variable. Columns 7–9 show results when using *debit card* ownership as the dependent variable.

5. Conclusion and policy recommendations

This study investigates the link between banking sector competition and financial inclusion. It also looks at the correlation between financial inclusion and demographic factors. Our investigation on the correlation between financial inclusion and key demographic variables shows a positive and statistically significant relationship between financial inclusion and age, income and education – which is intuitive. This implies that older people (who are more likely to be participating in the labour market) and those with higher income and more education are more likely to be financially included. On whether banking sector competition affects financial inclusion we find results that are consistent with the information hypothesis rather than the market power hypothesis. This suggests that in South Africa some bank market power is necessary to drive financial inclusion, perhaps reflecting the high costs associated with information gathering and monitoring. This is also in line with the suggestion in the literature that the banking sector does not need a very large number of small players to be competitive. Instead, it should be made more contestable, allowing large banks to address the problems of moral hazard and adverse selection while increasing their outreach.

Three important policy recommendations arise from the study. First, the marginalisation of the poor (and the youth) from the financial system must be addressed. However, increasing competition in the banking sector alone is not sufficient to address this challenge. There is a need for a multi-pronged approach that looks at bank competition, regulation, discrimination in the credit market, reduction of bank charges, and shadow banking. Second, increased market contestability is important and should continue to be promoted to enhance bank competition and financial inclusion. Third, usage rates for bank accounts by average South Africans are quite low, suggesting that banks are charging high transaction fees. Other players (such as fintechs) should be encouraged to participate in shadow banking to offer more competition to the incumbents and drive down transaction fees.

The study results must be interpreted with care, however, as there are a number of weaknesses, particularly with regard to measures of financial inclusion and bank

competition. [18] First, there is no comprehensive indicator of financial inclusion, particularly considering the definition advanced by Beck et al. (2015), which considers access, suitability and use. As used in the present study, account holding may overstate financial inclusion.

Second, the competition measures employed in this study focus on traditional banking activities and do not consider the extent of shadow banking activities – by banks themselves but also by non-bank players (such as retail shops). To the extent that shadow banking activities exert additional pressure on incumbent banks, the estimated banking sector competition indices may underestimate the true extent of competition in the sector.

Using pseudo panels also has inherent weaknesses. First, there is no internally determined optimal cohort size. The size of cohorts is important, as cohorts must be large enough to reduce or eliminate measurement errors without compromising on the number of cohorts (Guillerm 2017). Second, care must be taken to reduce cohort effects variability, which may be difficult if the sample size is too small (Guillerm 2017; Verbeek and Nijman 1992).

Future studies should thus use competition measures that take shadow banking activities into account and that adopt indicators that better capture the extent of financial inclusion.

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[18]   Despite their limitations, the indicators used to measure both financial inclusion and bank competition are commonly used in the literature.

Annexure

Table A1: Variable definitions and descriptions

Variable	Description	Source
Financial inclusion measures		
Bank account	A dummy variable taking a value of 1 if an individual has an account at a financial institution.	World Bank Global Findex Database (Findex)
General bank account	A dummy variable taking a value of 1 if an individual has an account at a financial institution, post office or microfinance institution (composite indicator).	Findex
Debit card	A dummy variable taking a value of 1 if an individual has a debit card.	Findex
Banking sector competition measures		
Lerner index	A measure of market power. A higher Lerner index score implies more market power and less competition; it has a minimum value of 0 (the case of perfect competition).	Estimated using information from the BankFocus database
Boone indicator	A measure of competition. A high absolute Boone indicator value indicates more competition.	Estimated using information from the BankFocus database
CR5	Concentration ratio. The CR5 measures the top five banks' total assets as a proportion of total banking industry assets. The concentration ratio ranges from 0 to 100.	Estimated using information from the BankFocus database
Explanatory variables		
Age	Age of the respondent in years.	Findex
Gender	A dummy variable taking a value of 1 if the head of a household is male, 0 otherwise.	Findex
Primary education	A dummy variable taking a value of 1 if an individual's highest level of education is primary education, 0 otherwise.	Findex
Secondary education	A dummy variable taking a value of 1 if an individual's highest level of education is secondary education, 0 otherwise.	Findex
Tertiary education	A dummy variable taking a value of 1 if an individual's highest level of education is tertiary education, 0 otherwise.	Findex
Quintile 1	Poorest 20%	Findex
Quintile 2	Second quintile	Findex
Quintile 3	Third quintile	Findex
Quintile 4	Fourth quintile	Findex
Quintile 5	Richest 20%	Findex
Private credit	Private credit as a percentage of GDP.	World Development Indicators Database

Table A2: Descriptive statistics for the survey years 2011, 2014 and 2017

Variable	2011					2014					2017				
	Obs	Mean	SD	Min	Max	Obs	Mean	SD	Min	Max	Obs	Mean	SD	Min	Max
Bank account	1 000	0.57	0.50	0	1	1 000	0.72	0.45	0	1	1 000	0.68	0.47	0	1
General account	1 000	0.59	0.49	0	1	1 000	0.74	0.44	0	1	1 000	0.70	0.46	0	1
Debit card	1 000	0.50	0.50	0	1	991	0.62	0.49	0	1	971	0.38	0.49	0	1
Gender	1 000	0.46	0.50	0	1	1 000	0.45	0.50	0	1	1 000	0.51	0.50	0	1
Primary	1 000	0.26	0.44	0	1	1 000	0.22	0.42	0	1	1 000	0.17	0.38	0	1
Secondary	1 000	0.64	0.48	0	1	1 000	0.66	0.48	0	1	1 000	0.74	0.44	0	1
Tertiary	1 000	0.10	0.29	0	1	1 000	0.12	0.32	0	1	1 000	0.08	0.27	0	1
Quintile 1	1 000	0.17	0.37	0	1	1 000	0.17	0.37	0	1	1 000	0.16	0.36	0	1
Quintile 2	1 000	0.17	0.38	0	1	1 000	0.19	0.39	0	1	1 000	0.17	0.37	0	1
Quintile 3	1 000	0.19	0.39	0	1	1 000	0.17	0.37	0	1	1 000	0.19	0.39	0	1
Quintile 4	1 000	0.21	0.41	0	1	1 000	0.21	0.40	0	1	1 000	0.22	0.41	0	1
Quintile 5	1 000	0.27	0.44	0	1	999	0.27	0.44	0	1	1 000	0.27	0.44	0	1
Age	1 000	37.63	15.86	15	87	999	37.32	15.90	15	92	1 000	34.38	14.29	15	91

Source: Own calculations from the Global Findex survey data.

Note: SD stands for standard deviation.

Table A3: Correlation matrix using 2017 survey data

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Bank account	1												
2. General account	0.99***	1											
3. Debit card	0.19	0.19	1										
4. Age	0.34***	0.33	-0.2	1									
5. Gender	0.01	-0.02	0.08	0.05	1								
6. Primary	0.14	0.13	-0.63***	0.81***	-0.03	1							
7. Secondary	-0.28	-0.26	0.27	-0.96***	-0.03	-0.87	1						
8. Tertiary	0.25	0.23	0.73	0.20	0.18	-0.36	-0.15	1					
9. Quintile 1	0.27	0.27	-0.33***	0.24	-0.14	0.24	-0.16	-0.19	1				
10. Quintile 2	0.01	0.02	-0.19	0.03	-0.02	0.08	-0.03	-0.09	-0.26	1			
11. Quintile 3	-0.16	-0.15	0.14	-0.51	-0.25	-0.37	0.47	-0.21	-0.20	-0.13	1		
12. Quintile 4	-0.1	-0.13	0.15	0.20	0.28	0.09	-0.28	0.39	-0.42	-0.47***	-0.28	1	
13. Quintile 5	-0.14	-0.11	0.42	-0.41***	-0.06	-0.37	0.45	-0.11	-0.34	0.07	0.22	-0.33**	1

Source: Own calculations from the Global Findex survey data

Note: *, ** and *** stand for 10%, 5% and 1% levels of significance, respectively.

Table A4: Estimating the translog functions used to estimate the marginal cost function

Dependent variable	ln(Total Cost)
Assets	1.172***
	(0.099)
0.5 x Assets^2	-0.0128*
	(0.007)
Price of Labour	0.599***
	(0.217)
Price of Funding	-0.148
	(0.119)
Price of Capital	0.548***
	(0.181)
0.5 x price of Labour^2	0.572***
	(0.151)
0.5 x price of Funding^2	0.130***
	(0.016)
0.5 x price of Capital^2	0.366***
	(0.080)
Assets x price of Labour	-0.010
	(0.015)
Assets x price of Funding	0.032***
	(0.009)
Assets x price of Capital	-0.022*
	(0.013)
Price of Labour x price of Funding	-0.168***
	(0.043)
Price of Labour x price of Capital	-0.404***
	(0.113)
Price of Funding x price of Capital	0.038
	(0.041)
Number of observations	164
Root mean-square error	0.082
Year dummies	Yes

Note: The table shows the results from estimating a translog cost function. All the variables are estimated in log form. ln(Total cost) stands for natural log of Total Cost. The standard errors are in parentheses. *, ** and *** stand for 10%, 5% and 1% levels of significance, respectively.

Table A5: Marginal effects table on determinants of financial inclusion

Variables	2011			2014			2017		
	Bank account	General account	Debit card	Bank account	General account	Debit card	Bank account	General account	Debit card
Age	0.031***	0.029***	0.030***	0.020***	0.019***	0.020***	0.004	0.004	0.017***
	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Age squared	-0.003***	-0.0003***	-0.0003***	-0.0001*	-0.0001***	-0.0002***	-0.000	0.000	-0.0002**
	(0.00)	(0.00)	(0.00)	(0.000)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Gender	0.020	0.013	0.058	-0.015	-0.012	-0.0004	-0.046	-0.043	0.036
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Secondary	0.233***	0.214***	0.201***	0.194***	0.196***	0.249***	0.115**	0.101**	0.122**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)
Tertiary	0.385***	0.379	0.296***	0.227***	0.219***	0.373***	0.213***	0.191***	0.306***
	(0.04)	(0.03)	(0.05)	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.07)
Quintile 2	0.083	0.080	0.071	0.015	0.009	0.039	0.062	0.073	0.116*
	(0.05)	(0.05)	(0.06)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)
Quintile 3	0.126**	0.139***	0.071	0.128***	0.121***	0.142***	0.076*	0.088**	0.119**
	(0.05)	(0.05)	(0.06)	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)	(0.06)
Quintile 4	0.214***	0.216***	0.131**	0.158***	0.156	0.220***	0.067	0.073*	0.125**
	(0.05)	(0.04)	(0.05)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.06)
Quintile 5	0.344***	0.349***	0.344	0.211***	0.202***	0.277***	0.136***	0.0132***	0.250***
	(0.04)	(0.04)	(0.05)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)

Note: *, ** and *** stand for 10%, 5% and 1% levels of significance respectively; robust standard errors are in parentheses.

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