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# **The impact of banking sector competition on access to finance: the case of selected African countries**

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by

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### *Abstract*

The impact of banking competition and access to finance is still the subject of debate amongst scholars, with some inferring the information hypothesis and others the market power hypothesis. This study investigates the consequences of bank competition on access to finance using data primarily from the World Bank's Enterprise Surveys for 33 African countries. The study computes country-level access to finance variables and uses three New Empirical Industrial Organisation measures (Boone indicator, H-statistics and Lerner index) for a cross-sectional and panel dataset. The results of the analysis are consistent with the information hypothesis as both the Lerner index and Boone indicator infer a positive relationship between concentration and access to finance in the long-run panel results. Although the H-statistic is positively related to access to finance, its low marginal effects indicate low transmission of input prices on African firms' revenue, alluding to the information hypothesis. African economies therefore need to improve information sharing by supporting businesses to maintain detailed records of financial information, and there needs to be more bank development for more cost effective collation of data during the lending process. Inducing more competition is also useful in reducing interest rates for better access to finance. Furthermore, the study finds that African countries that are experiencing growth in their GDP improve access to finance, and it is not countries with high GDP that have higher access to finance.

**Keywords:** Competition, Banking in Africa, Information Hypothesis, Market power hypothesis

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# 1. Introduction

Firms play a crucial role in society and the economy of a country. They are responsible for a range of beneficial outcomes such as providing goods and services, creating employment, generating taxes for governments, generating export earnings and other functions, which raises a country's GDP. Firms can also be used as a tool to promote equity in the distribution of wealth and address the developmental goals of a society. As such, societies are always seeking to support existing old and new firms, and encourage entry. Entry is especially encouraged by developing economies as – through creative destruction - it comes with innovation and competition, with old firms being replaced by more vibrant new firms.

A favourable business environment is critical for firms to survive and grow. However, many scholars infer that businesses in developing countries, particularly in Africa, face a more challenging business environment than those in developed countries (Dinh, Mavridis & Nguyen, 2012). One of the key factors that form part of the business environment of a country is access to finance. For larger firms, access to credit influences the investment patterns of the firm, and these can determine the rate at which a firm will innovate or invest into more efficient and profitable factors of production. In essence, this can alter the growth of the firm (Claessens and Tzioumis, 2006). For SMEs, financing affects the ability to reach key efficiencies, which contribute to a firm's competitiveness in the market. Financing constraints also act as a barrier to entry for potential firms (Aterido & Hallward-Driemeier, 2007).

A firm can acquire financing from multiple sources; internal financing includes sources such as retained income and proceeds for selling assets, and external funding includes grants, crowdfunding and equity financing. Firms can also acquire funding from external funding sources such as development institutions and privately owned commercial banks. Each funding source has advantages and disadvantages, however, amongst external funding options, bank financing is said to be more commonly used by entrepreneurs and offers loans to a wider variety of firms than equity financing (Winton and Yerramilli, 2008). A study done using the World Bank's Enterprise Survey dataset including data from 48 countries revealed that just over 40 percent of firm financing is sourced externally, and 19% of that financing comes from commercial banks (Demirguc-kunt, 2010). In addition, banking finance is available to about 17-32% of small enterprises in developing economies (Kumar, 2017).

Due to the presence of asymmetric information between firm owners and commercial banks, a widely accepted view amongst scholars is that bank loans are a more advantageous external financing source than external equity because issuance of debt is less appealing to inferior firms (Narayanan, 1988). This is because the loan requirements keep unprofitable firms out of the market (Narayanan, 1988). However, several other factors influence whether a commercial bank will finance a firm; amongst those is the institutional structure and concentration of banks within a country. The bank concentration in a country may determine the supply and costs of loans; however, literature has contradicting predictions on the direction of those factors (Beck,

Demirgüç-Kunt & Maksimovic, 2003).

Some of the fundamental theories of competition predict that market structure determines the conduct of firms in markets. In the banking market, the Structure-Conduct-Hypothesis predicts that with more concentration and less competition, banks have less competitive behaviour (Bain, 1959; Kocisova, 2016). This then results in higher banking prices (interest rates) and restricted credit supply (Bain, 1959; Beck, Demirguc-Kunt & Maksimovic, 2004; Kocisova, 2016). In contrast, the Efficient Structure (ES) hypothesis suggests that increase in concentration is the logical result of market forces (Demetz, 1973; Homma, Tsutsui & Uchida, 2014; Kocisova, 2016). This is derived from the inference that efficient firms outperform competing firms in markets, thus becoming bigger and obtaining higher profits that allows them to grow their market share, and ultimately increasing concentration (Demetz, 1973; Homma, Tsutsui & Uchida, 2014; Kocisova, 2016). More recently, theory on information asymmetries between lenders and borrowers infer the presence of adverse selection and moral hazard. This can result in a positive or non-linear relationship between the market structure (bank concentration) and the conduct of banks regarding supply of credit and interest rates (Beck, Demirguc-Kunt & Maksimovic, 2003). Similar to theoretical predictions, empirical literature also suggests contradicting results (Beck, Demirgüç-Kunt & Maksimovic., 2004; Love & Martinez Peria, 2014; Ayelew & Xianzhi, 2018; Moyo & Sibindi, 2020).

Some empirical studies done on the relationship between banking competition and availability and/or access to credit financing for businesses shows contradicting results as some studies infer the market power hypothesis (Rice and Strahan, 2010; Love and Peria, 2014; Lieberman, 2017) whilst others infer the information hypothesis (Fischer, 2000; Hoxha, 2013; Ayalew, 2018). These studies typically use firm-level survey data, usually from the World Bank Enterprise Surveys or country specific surveys, to conduct statistical analysis on either one or many countries across the world. Some of the most widely cited studies of this nature include Beck, Demirgüç-Kunt and Maksimovic, (2003) and Leon (2015b) who analyze the impact of banking sector competition in approximately 74 and 69 countries worldwide, respectively. Other scholars such as Agostino and Trivieri (2010) and Zarutskie (2003) conducts a similar study in Italy and the United States of America, respectively. However, only two studies of this nature have been conducted for the African continent. Ayalew and Xianzhi (2018) have investigated the impact of banking competition on firms in 27 African countries between 2015 and 2020, whilst Moyo and Sibindi (2020) differentiated their study by focusing on informal firms.

In light of the above, the paper seeks to investigate the research questions below:

- In Africa, does banking competition impact access to finance at a countrywide level?
- If so, then what is the impact? Is it a positive or negative impact?

This study adds to the existing body of knowledge by assessing the impacts of banking sector competition on access to finance at a macro countrywide level. The study covers the period between 2005 and 2020 for 33 countries, as countrywide survey data is converted into panel

data. The study also uses multiple publicly available datasets such as the World Enterprise Surveys, the Global Financial Development database, Doing Business (DB) database, Worldwide Governance Indicators (WGI) and World Development Indicators (WDI) to obtain key variables for the analysis.

Given that banks in Africa are still characterized by liquidity surplus and typically limit access to finance, the paper also contributes to the body of knowledge on credit access with a focus on the ability of businesses to access financing (Boateng et al, 2018; Asongu et al., 2016 & 2018). Furthermore, the study and analysis of competition is fairly new in Africa, as only about 32 of the 54 African countries were reported to have competition laws in place in 2015 (Lex Africa, 2018). This number was only 13 in 2000 with countries such as Angola and Mozambique only having recently enacted their competition laws after 2015- both these countries enacted their competition act in 2018 (Lex Africa, 2018).

The structure of the paper is as follows; section 2 gives a background on banking in Africa and the importance of investigating competition in said industry, section 3 reviews literature on competition in the banking industry along with methodologies used to investigate competition and its impact in banking. Section 4 gives a description of the methodology that this paper uses to conduct the study whilst Section 5 is a presentation of the results and analysis. Lastly, section 6 concludes.

## **2. Background**

Formal banking in Africa has advanced significantly since the first banks in the continent were established during colonisation. The many reforms that have occurred at different times have informed how it is currently functioning (Verhoef, 2017). Competition within the sector and the ability to lend has also undergone many changes along those reforms. The latest reform took place during the late 1980s and early 1990s where many countries introduced reforms to liberalize the financial sectors and move away from mostly government-owned banks which were highly regulated in the 1980s (Brownbridge & Gockel, 1998). These changes were based on the rationale that lending needed to be done using commercial criteria with no government intervention to encourage development. Consequently, Africa's banking system introduced higher interest rates (both nominal and real) to incentivise more deposits, and strengthened supervision and prudential regulation (Beck, Demirgüç-Kunt & Maksimovic., 2003; Beck & Cull, 2013). In the last twenty years, there has been continued institutional and regulatory upgrades as the continent has undergone globalization (Beck & Cull, 2013).

However, banking systems in Africa are still underdeveloped and characterized by challenges in terms of the depth of services provided, limited inclusion, efficiency, as well as concentration and low levels of competition (Beck & Cull, 2013; Aluko and Ajayi 2018). Literature on banking competition in Africa has indicated that banking systems in Africa are typically non-competitive, with a monopolistic competition market structure (Hauner and Peiris, 2008; Fosu, 2013a; Kouki and Al-Nasser, 2014; Sanya and Gaertner, 2012). Theory on market structure is

useful in order to analyse competition within banking, as well as the ability of banks to provide access to finance.

### **What is competition?**

Banking, like all other industries has a market structure, which can be analysed in order to make important improvements. Many of the earliest studies on markets pivoted on polar market structures, with many studies favouring perfect competition and others assessing the antithesis of monopoly markets. Neoclassical economics uses Adam Smith's invisible hand as one of the fundamental arguments supporting the desirability of perfectly competitive markets. In Smith's *Wealth of Nations* (1937), the main conjecture relating to market structure is that, under particular circumstances, perfectly competitive markets lead to socially optimal outcomes as if guided by an 'invisible hand'. This plays out by the market producing maximum output at a minimum resource cost, and thereafter efficiently distributing the output to those who value it the most. Through price mechanisms, the invisible hand is also said to equilibrate demand with supply in decentralised markets.

There are four standard assumptions underpinning perfectly competitive markets, including the conjecture that "(1) economies of scale are small relative to the size of the market; (2) output is homogenous; (3) there is perfect information; and (4) there are no entry and exit barriers" (Church & Ware, 2000). However, many actual markets do not meet the aforementioned assumptions, as they may be substantial economies of scale, such that the existence of many small players in the market may be somewhat inefficient. In addition, imperfectly competitive markets are said to give rise to product variety, quality and selection, along with innovation (Church & Ware, 2000).

However, the highest degree of imperfect competition, namely monopoly is considered inefficient as it gives rise to deadweight loss, which is the overall opportunity cost of the monopoly to society (Church & Ware, 2000). The welfare losses arise as monopolists obtain profits by charging monopoly prices at significantly low levels of output, this is due to the choice monopolists have to either sell more output at lower prices or extract more rents from few customers by charging higher prices. Monopolists produce at significantly less levels than the level whereby the consumer's willingness to pay equals the marginal cost. However, economists such as Henry Carter Adams have conducted studies on the increasing returns to scale and other welfare gains associated with monopolies, along with the existence of natural monopolies, which exist in markets whereby it is not possible to have more than one player (Bianchi, 2013). In natural monopolies, price regulation is a useful way to limit prices, and the exercise of market power by monopolists (Bianchi, 2013).

Another form of imperfect competition is that of an oligopoly. Here the market structure is characterised by a few large firms. This kind of market structure has been central to the study of Industrial Organisation (IO), which was established in the 1900s after the formation of national markets in manufactured goods (Church & Ware, 2000). At this time, manufactured goods industries produced differentiated products and had few large firms due to the high initial

costs of setting up manufacturing infrastructure (Church & Ware, 2000). A key concept in IO is that of market power, which is a firm's ability to profitably raise the price of a good in the market above its marginal cost. As such, IO analyses the creation of, exercise, maintenance, and the effects of market power in industries with few large firms, because firms in perfectly competitive markets should not have any market power (Church & Ware, 2000).

Overall, the existence or lack of market power, along with how much of it firms have can subsequently be interpreted as the degree of competition in an industry. Perfectly competitive industries are characterised with firms that have no market power at all. Here competition is fierce because, if there are firms which sell products way above cost to produce, then other firms should jump in to compete, subsequently reducing the mark-up until the price equals the marginal cost (Church & Ware, 2000). On the other hand, industries whereby firms can sustain their market power without the threat of competitors jumping in and reducing the price of goods can be said to be less competitive, with the most extreme form of market structure being a monopoly whereby the dominant firm has no competition at all (Church & Ware, 2000).

From the theories on market structure, assuming that there are economies of scale, it can be inferred that some degree of imperfect competition yields the desirable and most efficient outcome in all industries. Relatively new theories on barriers to entry are often used as a framework to analyse limited entry in industries that result in less than desirable competition (Church & Ware, 2000; Makhaya, Nhundu & Guma, 2015). In the African banking market, it is evident that there are still high levels of concentration and limited competition.

### **Competition in the African banking sector**

During colonisation, the banking industry in most African countries predominantly comprised of foreign-owned banks. For instance, Barclays and Standard Chartered were present in most of the British colonies (Verhoef, 2017). Although there were indigenously owned banks in countries such as Nigeria, they had small market shares as they were constrained in terms of capital, controlled small volumes of deposits and financed relatively risky undertakings (Uche, 2010).

When African financial systems underwent liberalization in the late 1970s and early 1980s, many banks that had been operational in the wake of independence during the late 1960s and early 70s closed down due to insolvency (Boone and Henry, 2004). It was unlikely that competition would improve thereafter as new foreign-owned banks hesitated to enter the African market due to the previous banking reform that enabled the government to impose credit directives and exchange control regulations. Bank licensing authorities were also hesitant to issue new banking licenses as they had witnessed failures of many local banks. Furthermore, government-owned banks typically cooperated with each other rather than compete with the rationale that government owns them all (Boone and Henry, 2003).

Currently, Africa's banking system has improved over the last three decades. In terms of competition, the number of banks has increased across Africa (Boone and Henry, 2003; Fosu, 2013a; Verhoef, 2017). However, the African banking sector remains highly concentrated with

the consensus that the market structure is monopolistic in nature (Hauner and Peiris, 2008; Fosu, 2013a; Kouki and Al-Nasser, 2014; Sanya and Gaertner, 2012). For instance, countries such as South Africa, Ghana and Zambia are said to have monopolistic competition and are largely uncompetitive even though there may not be cartel behaviour in South Africa, for example (Simbanegavi, Greenberg and Gwatidzo, 2015; Fosu, 2013b; Biekpe, 2011; Simpasa, 2013). Tunisia's banking sector is extremely non-competitive as it is a monopoly, Abdelkader and Mansouri (2014) showed that reforms implemented since 1978 have been ineffective in increasing competition in their study for the period between 1999 and 2003. However, Hauner and Peiris (2008) infer improved competition and a more efficient banking system in Uganda between 1999 and 2004.

There is also significant variation in the banking systems of many countries in the Africa, with countries such as South Africa having relatively advanced banking systems whilst countries such as Sudan have relatively underdeveloped banking systems.

### **Challenges in Africa's banking systems**

In comparison to other regions in the world, sub-Saharan Africa has the lowest scores of banking development indicators. These include indicators such as the ratio of liquid liabilities to GDP along with the ratio of credit to the private sector to GDP, as well as deposits to GDP (Beck & Cull, 2013; Allen et al., 2014; Fowowe, 2017). Many scholars attribute these challenges to the prevailing economic institutions, legal systems, legal traditions, openness to trade and capital, economic growth, macroeconomic stability, geographic endowments, political institution and democracy, culture as well as the level of human capital Africa (Aluko & Ajayi, 2018).

In 2011, liquid liabilities in African financial sectors averaged below 40 percent of GDP whilst and private credit averaged below 20 percent of GDP, this is substantially less than the proportions in other developing regions in the world (Beck & Cull, 2013; Allen et al., 2014). Furthermore, Beck and Cull (2013) note that the median country's deposits in Africa is only 25% whilst the rest of the world has median deposits of approximately 38%. The gap between deposit and credits is shows that African banks are less effective intermediaries of deposits.

African banks are also said to be less efficient whilst more profitable, with less competitive market structures (Beck & Cull, 2013). In their study that uses a sample of 307 banks from low income African countries and 720 banks from other developing countries, Beck and Cull (2013) find that the proportion of liquid assets to short-term funding and deposits is approximately 13.6 percentage points higher in African banks than is for non-African banks. Furthermore, banks in Africa have more capitalation, with an equity-asset ratio that is 1 percentage point higher than the non-African banks in the study. These comparisons depict African banks as well capitalized, over-liquid and providing limited lending to the real economy.

Subsequently, banks in Africa are also characterised by high interest rates, this can be attributed to the market structure and high risk associated with lending people in the continent (Beck & Cull, 2013). African banks also have high overhead costs in comparison to banks outside the continent (Beck & Cull, 2013). This due to higher reliance on non-interest income, their smaller size, less efficient contractual framework as well as higher inflation rates (Beck & Cull, 2013). The limited competition in banking is also a significant factor that contributes to high interest rates; this will be accounted for in better detail in the literature review.

The African banking sector also experiences short maturity periods, with deposits of a maturity of more than 10 years only accounting for less than 2 percent of total deposits (Beck & Cull, 2013). The majority (>80 percent) of deposits is made up of call deposits or deposits that are set to mature in less than a year (Beck & Cull, 2013). Similarly, approximately 60 percent of credit given is set to mature within a year, whilst about 2 percent of loans are for more than 10 years.

The size of an economy and its growth thereof affects the extent of development within its financial and banking sectors (Standley, 2010). In Africa, the relatively smaller size of many economies limits financial service providers from gaining scale economies, as there is limited demand for transactions such as savings, insurance, credit, or simple payments (Beck & Cull, 2013). Furthermore, the geographical dispersion of the population often means that financial service provisions outside of urban centres are not viable and inefficient (Beck & Cull, 2013).

Large parts of economic agents in Africa do business in the informal sector, they typically lack the formal documentation necessary for facilitating financial transactions. This includes business registration, title deeds for land as well as formal addresses (Beck & Cull, 2013; Onubedo & Yusuf, 2018). Furthermore, the poorly defined property rights coupled with weak contract enforcement and insufficient creditor protection exacerbates poor financial access in Africa (Standley, 2010; Beck & Cull, 2013). As such, banks face increased costs and higher risks in lending Africa's economic agents leaving a large segment of the population remains excluded from access to formal financial services.

Africa also has variation and volatility resulting from country-specific political institutions and unrest, as well as being resource dependent (Beck & Cull, 2013). Many African economies are largely dependent on commodity exports, as such they are vulnerable to the significant price volatility which is characteristic of commodities (Beck & Cull, 2013). During the last 50 years since Africa's independence, there has been political and social unrest across the different countries, which has affected legal and regulatory institutions. This has also led to significant variation in the banking systems of the continent as a whole. For instance, South Africa has higher levels of development in their banking systems whilst smaller and poorer countries with greater degree of political and social unrest have significantly shallow financial institutions (Beck & Cull, 2013).

As noted above, banking in Africa is also characterised by limited access to financial services at both an individual and enterprise level (Beck & Cull, 2013; Beck & Maimbo, 2013; Allen et

al., 2014). However, recent innovations including mobile banking and platforms have made significant progress in bridging the financial inclusion gap for both individuals and enterprises (Beck & Cull, 2013; Beck and Maimbo, 2013; Allen et al., 2014). For instance, in 2013, 5 percent of people in the median African country reported having used mobile phones for payment services than whilst only 3.8 percent reported the same in non-African developing economies (Beck & Cull, 2013).

Although there has been significant upgrading and improvement of banking in Africa, countries in the continent are still lagging behind many developing economies. Banking in Africa in nature has shorter maturity periods, it is also less efficient but more profitable than other developing countries as it is characterised by higher interest rates due to higher banking overhead costs as well as a competition premium.

### **Access to financing for African businesses**

In Africa, access to finance is typically recognized as a key constraint to the performance and growth of firms. Using the World Bank Enterprise Survey (WBES), a study done on perceptions of the investment climate in 26 countries in Sub-Saharan Africa showed that surveyed firms perceived finance as a constraint stronger than factors such as electricity, macroeconomic instability and labour regulations (Gelb et al., 2007; Fowowe, 2017). This view was particularly prevalent in countries with the lowest income levels (Gelb et al, 2007).

Additionally, a study by Dinh, Mavridis and Nguyen (2012) which used the World Bank Enterprise Survey conducted in 2006 - 2010; with a sample of approximately 39,000 businesses across 98 economies found that the second key obstacle experienced by firms in North Africa and Sub-Saharan Africa is limited accessibility of finance. Furthermore, Dinh, Mavridis and Nguyen (2012) also takes a closer look at 38 Sub-Saharan African. They find that access to finance ranked as the biggest challenge in 11 countries, whilst 16 countries ranked electricity as the biggest constraint. Similarly, a study by Kuntchev et al. (2012) which also uses the World Bank Enterprise Survey suggests that SMEs in Sub-Saharan Africa, East Asia and Pacific and in South Asia are prone to complete credit constraint than any other regions. This means that these SMEs have no form of external credit despite actively seeking credit. Fowowe (2017) also shows that inadequate finance restrains growth of African firms.

Other country and area specific literature also show finance accessibility as a key constraint to firms in Africa. Amegashie-Viglo and Bokor (2014) find insufficient capital as the top obstacle to local artisans and entrepreneurs in Ghana, Volta Region. In Mogadishu, Somalia many small businesses are unable to meet the requirements for finance, and thereafter unable to gain access to finance (Ali & Ali, 2013). They have challenges providing collateral, showing ability to repay, and providing a security deposit or guarantor (Ali & Ali, 2013). Similarly, in South Africa's Limpopo province, managers of SME and micro-enterprises consider access to finance as the key constraint (Donga, Ngirande & Shumba, 2016). Given that Limpopo is amongst the least developed provinces in the country, the main challenges in accessing finance are lack of

records for tax, credit history and business registration along with lack of collateral (Donga Ngirande & Shumba, 2016).

In Sub-Saharan Africa, accessing finance is an even bigger obstacle to women owned businesses in comparison to their male-owned counterparts. Lutz and Olthaar (2017) find that in Sub-Saharan Africa, women are generally regarded as lacking financial competence to manage funds, and hence it is more probable that their male counterpart owners and managers will be granted business loans. Another study done in the same region reveals that it is unconditionally less likely for women owned businesses to use formal credit than male owned businesses (Aterido, Beck & Iacovone, 2013). However, this gender disparity fades when accounting for key firm observable characteristics such as firm size and the owners' age (Aterido, Beck & Iacovone, 2013). As such, the firm size is a better explanatory variable of a firm's chances of gaining access to credit (Aterido, Beck & Iacovone, 2013).

Smaller businesses are also more likely to face the obstacle of insufficient access to finance than their larger counterparts. Multiple studies focused on developing countries and different parts of Africa have confirmed this hypothesis (Aterido, Beck & Iacovone, 2013; Fowowe, 2017; Dinh. Mavridis & Nguyen, 2012). Kuntchev et al. (2012) observe that smaller firms typically finance their working capital and investments through trade credit and informal sources of finance. In the formal credit market, smaller firms frequently face more burdensome collateral requirements and unfavourable interest rates (Onubedo and Yusuf, 2018). Furthermore, larger businesses are more likely to have recorded reports of historical performance and operations as they are often required to keep detailed records of such (Onubedo and Yusuf, 2018; Kumar, 2017). This also improves their ability to obtain credit as a higher level of transparency reduces credit risk. Smaller businesses on the other hand do not have detailed financial information, hence they are considered as being more risky (Onubedo and Yusuf, 2018; Kumar, 2017).

Overall, accessibility of formal finance is still a prevailing challenge for businesses in Africa, particularly smaller sized and women owned firms. It is therefore noteworthy to consider the characteristics of the banking industry in Africa.

Over time, there have been improvements in Africa's banking system, as it is more stable and offers more in depth financial services than ever before. There is also more supervision and prudential regulation. In terms of competition, more firms have been able to gain entry in the market. Nevertheless, there are still many barriers to entry in Africa's banking sector. Banks in Africa have less competition and more capital reserves, which means they lend less than other non-African developing areas.

Theories on market structure outline that perfect competition yields socially optimum outcomes. In the banking industry, this translates to outcomes such as optimal lending at optimal prices that is useful for investment and the development of the country at large. However, in actual markets there may be economies of scale to hence the industry does not benefit from perfect competition. Consequently, some level of imperfect competition is useful

as complete monopolies would largely be inefficient in the banking industry, as they would lead to limited supply of credit and higher. The current banking systems in Africa do have some competition, and there is consensus amongst scholars that there is monopolistic competition. However, businesses and individuals still have limited access to lending. Businesses in particular, identify insufficient access to financing as one of the primary constraints to growth. As such, it is important to assess whether competition impacts lending for businesses in the African continent.

### **3. Literature Review**

Some existing empirical studies on explore the impact of bank competition on stability, growth, innovation, and risk. The studies usually focus on the impacts for one country or for small to medium entities. For instance, one study assess the relationship of bank concentration on industry growth (Cetorelli and Gambera, 2001). These scholars conclude that less competition has a generally depressing effect on the growth of all sectors and firms indiscriminately. However, they also find that less competition enhances the growth of industrial sectors that are in greater need of external financing by encouraging loan access to newer firms. On the other hand, Hope, Gwatidzo and Ntuli (2013) look at 10 African economies to assess the consequence of bank competition on financial stability. They conclude that concentration is robustly and positively related to the financial stability of the studied countries.

A more recent example by Cornaggia et al. (2015) assesses the impact of bank concentration on innovation. The study infers that higher bank competition induces public corporations to innovate less at a state-level whilst resulting in gre among private firms dependent on external financing. Owen and Pereira (2018) prioritize the impact of bank competition on access to finance for individuals across 83 different countries. They discover that more bank concentration is linked with more deposit accounts and loans in their study on the impact of banking competition on lending.

Some studies have also assessed the impact of competition on access to finance amongst business. These studies are described in the Table 1 below, and will be further discussed within this section.

**Table 1: Summary of previous studies on the impact of banking sector competition on lending/access to finance**

| Study                                   | Region                                         | Data type            | Model used              | Measure(s) of competition                  | Hypothesis supported    |
|-----------------------------------------|------------------------------------------------|----------------------|-------------------------|--------------------------------------------|-------------------------|
| Gonzalez and Gonzalez (2008)            | 39 countries worldwide                         | firm-level           | GMM                     | CR3                                        | Information hypothesis  |
| Dinc(2000)                              | theoretical                                    | theoretical          | Game Theory             | Game Theory                                | Market power hypothesis |
| Hoxha (2013)                            | Approx 37 countries worldwide                  | firm-level           | OLS                     | HHI, CR3 and H-statistic                   | Information hypothesis  |
| Ryan, O'Toole and McCann (2014)         | 20 European countries                          | firm-level(SMEs)     | GMM                     | Lerner and HHI                             | Market power hypothesis |
| Leon (2015b)                            | 69 developing and emerging economies worldwide | firm-level           | Probit                  | H-statistic, Boone indicator, Lerner index | Market power hypothesis |
| Petersen and Rajan(1995)                | United States of America                       | firm-level           | Tobit                   | HHI                                        | Information hypothesis  |
| Fischer(2000)                           | Germany                                        | firm-level           | Probit                  | HHI                                        | Information hypothesis  |
| Zarutskie(2003)                         | United States of America                       | firm-level           | OLS                     | Actual event proxy                         | Mixed results           |
| Agostino and Trivieri(2010)             | Italy                                          | firm-level           | Double Hurdle and Tobit | HHI and H-statistic                        | Market power hypothesis |
| Lieberson(2017)                         | United States of America                       | firm-level(SMEs)     | Diff-in-diff            | HHI                                        | Market power hypothesis |
| Rice and Strahan (2010)                 | United States of America                       | firm-level(SMEs)     | OLS                     | HHI                                        | Market power hypothesis |
| Beck, Demirgüç-Kunt & Maksimovic (2004) | 74 countries worldwide                         | firm-level           | MLE                     | CR3                                        | Market power hypothesis |
| Love and Pería (2015)                   | 53 countries worldwide                         | firm-level           | LPM                     | CR3, Boone, Lerner and H-statistic         | Market power hypothesis |
| Ayalew and Xianzhi(2018)                | 28 African countries                           | firm-level           | Probit                  | CR3, HHI, Boone, Lerner                    | Information hypothesis  |
| Moyo and Sibindi(2020)                  | 14 Sub Saharan African countries               | firm-level(informal) | Logit, Probit and LPM   | CR5, Boone, Lerner and H-statistic         | Mixed results           |

\*MLE is Maximum Likelihood Estimation, LPM is Linear Probability Model, OLS is Ordinary Least Squares and Diff-in-diff is Difference in Difference model. CR3 is the concentration ratio of the three largest firms in the market; CR5 is the concentration ratio for the largest five firms in the market.

## Measures of competition

One of the key variables that are critical to evaluating the market power of firms in a sector is that of market definition. Various disciplines of economic study have different interpretations for market definitions, for instance institutional economists determine market boundaries by using transactional costs, whilst management scholars define what they term as a strategic market which is the smallest possible space in which a firm can be a viable competitor (Boshoff, 2013). In competition economics, market definition has been a contentious issue since the 1960s and 1970s. The discipline often distinguishes between economic markets and antitrust markets, with the economic markets referring to a set of products, buyers and sellers along with the geographic region where the buyers and sellers transact and set prices for each product (Church & Ware, 2000). Ruffin (1971) distinguishes those territories of unrestricted commerce, which result in the price maintaining the same level throughout can as a market. In these markets, the only difference in prices constitutes transport costs due to differences in location. Furthermore, economic markets categorize homogenous goods to be in the same market since they are perfect substitutes. A set of differentiated products is in the same economic market if the price of each of the products in the set affects the demand and/or supply of the rest of the products in the set, whilst simultaneously not affecting demand on any other product outside the specified set (Church & Ware, 2000).

On the other hand, antitrust markets are defined with the aim of assessing market power, as such they are termed as the 'relevant market' and described as the smallest set of products or geographical location worth monopolising (Church & Ware, 2000; Boshoff, 2013). Competition scholars focus on determining all competing products that are substitutable, such that each one constrains the market power of the others (Boshoff, 2013). There are two methods to identifying antitrust markets, depending on the availability of data. Either competition economists can use data and econometric models to find estimates of demand elasticities, or they can use the structural approach that involves using indirect evidence to infer substitutability of different products and thereafter defining the relevant market (Church & Ware, 2000).

Therefore, competition can be measured once the market definition has been determined. However, it is not simple to assess competition because it is complex and not easily observable, more especially in markets with imperfect competition (excluding monopolies). As such, oligopoly theory allows scholars to extrapolate many testable hypotheses and therefore measure the degree of competition. There are therefore multiple methodologies to assess market power and the overall competitiveness of industries.

Orthodox IO based early research on the indices of competition in the Structure-Conduct-Performance (SCP) paradigm which infers that there is a positive relationship between prospects of collusion and market concentration, i.e. the likelihood of collusion increases as market concentration increases ((Mason 1939; Bain, 1959; Leon, 2015a). The structural approaches inferred by the SCP paradigm measure the concentration of an industry. Some of the measures of competition derived based on the SCP paradigm include the k-concentration

measure and Herfindahl-Hirschman Index (HHI). Scholars undermine the linkage between structure and conduct due to the existence of the Bertrand equilibrium and the theory of contestability, which suggests that firms can act competitively if there are low barriers to entry.

Nevertheless, many scholars criticise and find discrepancies in the SCP paradigm, and its associated measures. As such, scholars have gone on to establish some non-structural measures of competition by directly observing firm conduct (Leon, 2015a). These measures are often referred to as New Empirical Industrial Organisation (NEIO) since they emerged from empirical observation of markets (Leon, 2015a). Early forms of NEIO indices of competition include the Lerner index, conjectural variation model and the Panzar-Rosse model (Leon, 2015a). Subsequently, other newer measures such as the Boone indicator and the Persistence of Profits model have also been developed (Leon, 2015a).

The Lerner index is popular as it has little data requirements; however, it is a measure of pricing market power and not necessarily a proxy of competition. The conjecture variation model is an elasticity-adjusted Lerner index, whilst the Panzar-Rosse model is an indicator that captures the transmission of input prices on a firm's revenue. Low values indicate weak transmission and indicate the exercise of market power in pricing whilst higher values indicate more competition. However, scholars suggest that the interpretation of the H-statistic is not straightforward as it can be interpreted as a continuous monotonic index of conduct; meaning that the sign of the H-statistic as well as its magnitude is important (Panzar and Rosse, 1987). In addition, for industries experiencing sustained elasticity of demand the H-statistic can be as alternatively an increasing or decreasing function of the Lerner index alluding that higher values of the H-statistic do not necessarily imply lower market power (Shaffer, 1983; Panzar and Rosse, 1987). The Panzar-Rosse model is the most widely used measure of competition in banking. The Boone indicator is a measure that rests on the conjecture that more efficient firms are allocated more profits in as competition improves, it is computed as the summation of the elasticity of ratio of profits to marginal costs. This value can be either negative or positive.

Choosing the relevant measure of competition is important because different measures infer different conclusions about the inference of competition (Degryse et al., 2009; Leon, 2015a). The usefulness of each measure depends on data availability, the assumptions made about competition, along with the research questions being investigated (Degryse et al., 2009; Leon, 2015a).

Empirical literature indicates that different studies have utilized different indicators to measure competition and concentration within the banking industry. Table 1 shows that many of the earlier studies made use of either the HHI or CR3, which are structural measures. However, the more recent studies typically include one structural measure along with other indicators including the Lerner Index, Boone indicator and H-statistic in order to get results that are more robust.

Consequently, this study makes use of non-structural methods to measure countrywide competition within respective banking sectors. It makes use of the Lerner index, the Panzar-

Rosse H-statistic as well as the Boone indicator in order for more robust results and interpretation.

### **Measures of access to finance**

Although there is literature on approaches for measuring access to credit for households and individuals (Daigne, Zeller & Sharma, 2000; Browning & Lusardi, 1996; Deaton, 1992; Zeller, 1994) there is limited literature relating to measurement methodologies for firms. Cavalluzzo et al. (2002) measure access to credit using the probability of an approval of a loan application in their study on competition and small business financing whilst Beck, Demirgüç-Kunt and Maksimovic (2003) compute a financial obstacles indicator in their study. Popov and Udell (2012) computes a credit constraint on their study on that assesses the supply of finance subject to the presence of the financial crisis. Similarly, scholars such as Love and Peria (2015), Ayalew and Xianzhi (2018) and, Moyo and Sibindi (2020) have used the credit constraint indicator. They typically compute a binary variable that is the answer of either yes (1) or no (0) for the question of whether or not a firm was approved for a loan.

### **Hypothesis**

Theory makes contradicting inferences about the effect of bank concentration on the supply and cost of loans. Standard economic theory predicts that higher concentration leads to a lower supply of loans at a higher cost (Beck, Demirgüç-Kunt & Maksimovic., 2004). In addition, Vives (2001) states that if there is less competition pressure in banking, there will be no incentive to innovate and expand services, which should lead to more finance opportunities for more firms. More fierce competition also induces banks to borrow riskier profiled customers, whilst concentration causes firms to lend to the safer and more homogenous borrower. In the case of firms, this would be the less risky incumbent firms, which can afford the services. This theory is referred to as structure-performance or market power hypothesis (Beck, Demirgüç-Kunt & Maksimovic., 2003 & Love and Martinez Peria, 2014).

On the other hand, taking into account informational asymmetries that may cause moral hazard and adverse selection leads to theories that infer a positive or nonlinear relation between banking concentration and access to loans for borrowers in a dynamic setting (Love and Peria, 2015). Banks are therefore incentivised to invest in monitoring and the acquisition of private information. The more market power a bank has, the more it is motivated to invest in the acquisition of information and to build long-term relationships with borrowers. This allows for better internalization of the costs of the aforementioned activities and lowers the risk of borrowers leaving for other bank (Love and Martinez Peria, 2014). This is called the information hypothesis. Empirical studies show that the different theories infer contradicting outcomes across the different measures of concentration such as the Lerner index, HHI and the Boone indicator.

Beck, Demirgüç-Kunt and Maksimovic (2003) shows that bank concentration expands

financing obstacles and reduces the prospects of obtaining bank finance, with the impact increasing with decreased firm size. However, well-developed institutions, higher levels of development and a larger share of foreign-owned banks dampen the impacts of banking concentration. Similarly, Love and Peria (2015) suggest that higher market power reduces access to financing whilst Ryan, O'Toole and McCann (2014) further highlight that this impact is exacerbated in financial systems that are more dependent on banks. In their study in 69 emerging countries around the world Leon (2015b) and also conclude that banking competition worsen financing constraints whilst competition positively influences a firm's need for external financing and application for it, as well as banks' decision to approve loans. They also find that smaller firms are less likely to apply for bank financing and have lower access to bank loans. With game theory underpinnings, Dinc (2000) also infers that increased competition from alternative markets such as bonds and securities avails increases the supply of loans for more risky borrowers.

However, scholars such as Gonzalez and Gonzalez (2008), Peterson and Rajan (1995) and Ayalew and Xianzhi (2018) prove the information hypothesis. Gonzalez and Gonzalez infer that bank concentration improves firms' prospects of access to long-term debt as relationships between banks and firms mitigate information asymmetry between the two stakeholders. Similarly, Peterson and Rajan (1995) find that the extent of competition is important in determining the value of relationships between firms and banks. They suggest that other factors such as the ability to internalize benefits of assisting borrowers may also be a key rationale for why small firms gain funding in more concentrated banking markets in rural areas as opposed to urban. Although Ayalew and Xianzhi (2018) have findings that support the information hypothesis, however they also find that bank competition has encourages more firms to apply for a new line of credit and , and encourages banks to approve more loan applications.

On the other hand, Zarutskie (2003) show mixed results for their study on the impacts of increased competition due to the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994. In more competitive markets, they found that newer smaller firms had less access to external financing whilst older firms had access to more long-term finance. Moyo and Sibindi (2020) also yield inconsistent results on whether or not competition improves access to finance for informal firms; they suggest that improving competitiveness of the banking sector should be promoted. They also suggest that there needs to be more in depth and better collection of data on informal firms in Africa.

## 4. Methodology

The goal of this study is to analyse the impact of bank competition on access to credit a countrywide level, on selected African countries. In order to conduct the analysis, multiple publicly available datasets have been used with the main being the World Enterprise Surveys (WES) by the World Bank. The WES has firm-level data from over 125,000 businesses located in approximately 139 countries across the world; these surveys have been collected from as

early as 2005/6. It has about 100 measures that gauge the quality of the business environment in the world, the indicators covers areas including access to finance, corruption, infrastructure, and crime, competition, and performance measures.

The study also makes use of sources such as the Global Financial Development database (GFD), Doing Business (DB) database, Worldwide Governance Indicators (WGI) and World Development Indicators (WDI) to obtain competition measures as well as other explanatory variables.<sup>1</sup> The detailing on how the different datasets were merged and explanatory variables were collated is on the section below, along with a more detailed empirical model.

In order to assess the impact of bank competition on access to credit, the following model is specified:

Countrywide access to finance = (countrywide banking sector competition measure, country specific control variables) + error term

### ***Measuring access to finance***

This study uses the WBES to obtain a percentage level of access to finance for each African country. This measure is computed by using the answer for the question “*In the last fiscal year, did the establishment apply for new loans/lines of credit?*” and the follow up question, “*What was the outcome of that most recent application for loan/line of credit?*” The final access to finance measure is the ratio of approved loans to the number of firms that have admitted to either applying or not applying for a loan.

Due to inconsistencies in the reporting on the aforementioned questions for all the datasets available, this paper makes use of data for 33 African countries for the period between 2005/6 until 2020 to obtain a cross-sectional dataset and an unbalanced panel dataset. The cross-sectional dataset only contains the latest data for each of the 33 countries in the study, which spans from 2010 – 2020 only. On the other hand, the unbalanced panel dataset of either two or three periods from 2006 – 2020. This study conducts analysis on the cross-sectional and unbalanced panel datasets obtained from the WBES. The table below gives a description of access to finance in each country and region over the period between 2006 and 2020.

Table 2: Access to finance

| <b>Country</b> | <b>Survey year</b> | <b>No. of firms</b> | <b>Apply</b> | <b>Need</b> | <b>Accepted</b> | <b>2nd most prevalent reason</b> |
|----------------|--------------------|---------------------|--------------|-------------|-----------------|----------------------------------|
| Angola         | 2006               | 425                 | 0,17         | 0,55        | 0,04            | Complex application              |
| Angola         | 2010               | 345                 | 0,11         | 0,37        | 0,09            | Complex application              |
| Botswana       | 2006               | 342                 | 0,19         | 0,17        | 0,13            | Complex application              |
| Botswana       | 2010               | 264                 | 0,25         | 0,21        | 0,35            | Unfavourable interest rates      |
| Eswatini       | 2006               | 304                 | 0,20         | 0,16        | 0,13            | Complex application              |

<sup>1</sup> see Appendix: Table 1 for a detailed account of each explanatory variable.

|                        |      |      |             |             |             |                                                          |
|------------------------|------|------|-------------|-------------|-------------|----------------------------------------------------------|
| Eswatini               | 2016 | 138  | 0,15        | 0,44        | 0,15        | Unfavourable interest rates                              |
| Lesotho                | 2009 | 147  | 0,32        | 0,22        | 0,16        | Unfavourable interest rates                              |
|                        | 2016 | 148  | 0,28        | 0,27        | 0,26        | High collateral requirements/Unfavourable interest rates |
| Lesotho                |      |      |             |             |             |                                                          |
| Malawi                 | 2009 | 149  | 0,28        | 0,36        | 0,36        | Unfavourable interest rates                              |
| Malawi                 | 2014 | 499  | 0,28        | 0,38        | 0,19        | Unfavourable interest rates                              |
| Madagascar             | 2009 | 442  | 0,24        | 0,36        | 0,19        | Unfavourable interest rates                              |
| Madagascar             | 2013 | 515  | 0,20        | 0,36        | 0,10        | Unfavourable interest rates                              |
| Mozambique             | 2007 | 599  | 0,18        | 0,60        | 0,11        | Unfavourable interest rates                              |
| Mozambique             | 2018 | 601  | 0,11        | 0,44        | 0,06        | Unfavourable interest rates                              |
| Namibia                | 2006 | 329  | 0,21        | 0,10        | 0,14        | Complex application                                      |
| Namibia                | 2014 | 522  | 0,21        | 0,27        | 0,01        | High collateral requirements                             |
| South Africa           | 2007 | 1057 | 0,21        | 0,28        | 0,16        | Unfavourable interest rates                              |
| South Africa           | 2020 | 1073 | 0,03        | 0,12        | 0,02        | Complex application                                      |
| Zambia                 | 2007 | 603  | 0,20        | 0,44        | 0,14        | Unfavourable interest rates                              |
| Zambia                 | 2013 | 686  | 0,12        | 0,42        | 0,08        | Unfavourable interest rates                              |
| Zambia                 | 2019 | 598  | 0,11        | 0,53        | 0,07        | Unfavourable interest rates                              |
| Zimbabwe               | 2011 | 595  | 0,20        | 0,61        | 0,15        | Unfavourable interest rates                              |
| Zimbabwe               | 2016 | 591  | 0,16        | 0,61        | 0,08        | Unfavourable interest rates                              |
| <b>Southern Africa</b> |      |      | <b>0,19</b> | <b>0,36</b> | <b>0,14</b> |                                                          |
| Cameroon               | 2009 | 358  | 0,48        | 0,34        | 0,29        | High collateral requirements                             |
| Cameroon               | 2016 | 321  | 0,21        | 0,40        | 0,14        | Unfavourable interest rates                              |
| Chad                   | 2009 | 150  | 0,25        | 0,42        | 0,14        | Complex application                                      |
| Chad                   | 2018 | 150  | 0,04        | 0,41        | 0,03        | Complex application                                      |
| <b>Central Africa</b>  |      |      | <b>0,24</b> | <b>0,39</b> | <b>0,15</b> |                                                          |
| Benin                  | 2009 | 146  | 0,44        | 0,36        | 0,34        | Complex application                                      |
| Benin                  | 2016 | 148  | 0,31        | 0,32        | 0,28        | High collateral requirements                             |
| Cote d'Ivoire          | 2009 | 509  | 0,13        | 0,37        | 0,09        | High collateral requirements                             |
| Cote d'Ivoire          | 2016 | 342  | 0,23        | 0,44        | 0,15        | High collateral requirements                             |
| Gambia                 | 2006 | 174  | 0,14        | 0,43        | 0,07        | Complex application                                      |
| Gambia                 | 2018 | 148  | 0,13        | 0,69        | 0,11        | Unfavourable interest rates                              |
| Ghana                  | 2007 | 616  | 0,23        | 0,59        | 0,11        | Unfavourable interest rates                              |
| Ghana                  | 2013 | 703  | 0,24        | 0,53        | 0,20        | Unfavourable interest rates                              |
| Guinea                 | 2006 | 223  | 0,15        | 0,39        | 0,02        | Complex application                                      |
| Guinea                 | 2016 | 130  | 0,05        | 0,42        | 0,05        | Unfavourable interest rates                              |
|                        | 2009 | 148  | 0,23        | 0,42        | 0,15        | Complex application/Unfavourable interest rates          |
| Liberia                |      |      |             |             |             |                                                          |
| Liberia                | 2017 | 149  | 0,19        | 0,46        | 0,16        | Complex application                                      |
| Mali                   | 2007 | 490  | 0,27        | 0,59        | 0,06        | Complex application                                      |
| Mali                   | 2010 | 311  | 0,33        | 0,39        | 0,09        | Complex application                                      |
| Mali                   | 2016 | 168  | 0,34        | 0,35        | 0,27        | High collateral requirements                             |
| Nigeria                | 2007 | 2387 | 0,09        | 0,69        | 0,02        | Complex application                                      |
| Nigeria                | 2010 | 3155 | 0,19        | 0,58        | 0,07        | Unfavourable interest rates                              |
| Nigeria                | 2014 | 2468 | 0,05        | 0,44        | 0,01        | Unfavourable interest rates                              |

|                        |      |      |             |             |             |                              |
|------------------------|------|------|-------------|-------------|-------------|------------------------------|
| Senegal                | 2007 | 506  | 0,23        | 0,57        | 0,10        | Complex application          |
| Senegal                | 2014 | 556  | 0,16        | 0,49        | 0,13        | High collateral requirements |
| Sierra Leone           | 2009 | 150  | 0,27        | 0,53        | 0,17        | Complex application          |
| Sierra Leone           | 2017 | 152  | 0,20        | 0,53        | 0,13        | High collateral requirements |
| <b>West Africa</b>     |      |      | <b>0,21</b> | <b>0,48</b> | <b>0,13</b> |                              |
| Egypt                  | 2013 | 2813 | 0,07        | 0,24        | 0,04        | Unfavourable interest rates  |
| Egypt                  | 2016 | 1791 | 0,09        | 0,21        | 0,06        | Complex application          |
| Morocco                | 2007 | 657  | 0,21        | 0,23        | 0,30        | Unfavourable interest rates  |
| Morocco                | 2013 | 387  | 0,29        | 0,11        | 0,25        | Unfavourable interest rates  |
| Morocco                | 2019 | 962  | 0,12        | 0,44        | 0,11        | Unfavourable interest rates  |
| <b>Northern Africa</b> |      |      | <b>0,16</b> | <b>0,25</b> | <b>0,15</b> |                              |
| Burundi                | 2006 | 270  | 0,27        | 0,39        | 0,15        | Complex application          |
| Burundi                | 2014 | 156  | 0,41        | 0,34        | 0,38        | Unfavourable interest rates  |
| Ethiopia               | 2011 | 624  | 0,24        | 0,40        | 0,14        | High collateral requirements |
| Ethiopia               | 2015 | 844  | 0,29        | 0,43        | 0,25        | High collateral requirements |
| Kenya                  | 2007 | 657  | 0,41        | 0,35        | 0,27        | Unfavourable interest rates  |
| Kenya                  | 2013 | 737  | 0,29        | 0,22        | 0,26        | Unfavourable interest rates  |
| Kenya                  | 2018 | 972  | 0,25        | 0,29        | 0,23        | Unfavourable interest rates  |
| Rwanda                 | 2006 | 212  | 0,33        | 0,30        | 0,24        | Complex application          |
| Rwanda                 | 2011 | 232  | 0,48        | 0,25        | 0,41        | Unfavourable interest rates  |
| Rwanda                 | 2019 | 358  | 0,19        | 0,46        | 0,16        | Complex application          |
| Tanzania               | 2006 | 419  | 0,23        | 0,37        | 0,16        | Complex application          |
| Tanzania               | 2013 | 738  | 0,13        | 0,57        | 0,11        | Unfavourable interest rates  |
| Togo                   | 2009 | 154  | 0,29        | 0,45        | 0,18        | Complex application          |
| Togo                   | 2016 | 148  | 0,38        | 0,31        | 0,32        | Complex application          |
| Uganda                 | 2006 | 563  | 0,20        | 0,48        | 0,15        | Complex application          |
| Uganda                 | 2013 | 665  | 0,10        | 0,49        | 0,07        | Unfavourable interest rates  |
| <b>East Africa</b>     |      |      | <b>0,28</b> | <b>0,38</b> | <b>0,22</b> |                              |
| All countries          |      |      | <b>0,22</b> | <b>0,37</b> | <b>0,16</b> |                              |

*Source: Author's own computations from the WBES.*

Collectively, firms in all of the countries within this study have a 16% average chance of being approved for a credit, with Rwandan firms in 2011 having the highest chances (41%) of being approved for a loan. The region in which firms have the highest likelihood of approval for a loan is East Africa, as 28% of firms have been approved for loans in that period. However, it can be argued that firms in West Africa have the highest chances of being approved for a loan once they have applied because there is a 1% gap between firms that have applied and those that have been approved for loans (15% of firms have been approved for loans whilst 16% applied). Nevertheless, it is important to consider the need for finance and key reasons why firms have not applied for finance. The need for finance comprises of those firms whom have not applied for a loan for reasons either than not needing a loan at that particular time.

Approximately 37% of all the firms in the study expressing the need for finance, this means that for every one firm approved for a loan more than two firms that need a loan are not approved for it. Given that for all countries, the most popular reason for not applying for a loan

is that the firm does not need one, the second most prevalent reason is useful in determining the key issue as perceived by firms. The second most prevalent reasons why firms in all countries do not apply for loans is that the interest rates for borrowing are unfavourable. With scholars such as Hauner and Peiris (2008) and Fosu (2013a) inferring the non-competitive banking systems in Africa, the description of the data indicates that there may be some positive relation between competition and the loan interest rates suggested by the market power hypothesis.

### ***Measuring competition***

There are multiple measures for competition including structural (CR3, HHI) and NEIO (Lerner index, H-statistic, Boone indicator) approaches. As previously indicated, this study makes use of the NEIO approaches to measuring competition.

1. The equation below can be used to compute the Lerner index is as follows (Lerner, 1934) :

$$L_i = P(Q) - C_0 q_i(q_i, w_l) P(Q)$$

, where  $C_0 q_i(q_i, w_l)$  is the marginal cost of firm  $i$ . The Lerner index value is between 0 in a perfectly competitive market and the elasticity of demand in a monopolistic market with a (Stiglitz, 1987, 1989; Bulow and Klemperer, 2002).

2. The H-statistic can be specified as follows:

$$H = \sum_{i=1}^n \beta_i$$

Therefore, the H-statistic is the total summation of the elasticities ( $\beta_i$ ) of the total interest revenue of the banks accounting for their costs (Rosse and Panzar, 1977; Vesala, 1995).

3. The Boone indicator is computed with the profitability equation below:

$$\ln(s_i) = \alpha + \beta_0 \ln(c_i) + \varepsilon_{0i}$$

, where  $s_i$  is the market share of bank  $i$ ,  $c_i$  a measure of costs (proxies efficiency) and  $\beta_0$  is an indicator of competition -  $\beta_0$  is continuous (Boone, 2008; Van Leuvensteijn et al., 2011; Tabak et al., 2012).

This study makes use of the Lerner index, Boone indicator and H-statistics available in the GFD database. To account for time differences within the panel dataset, the average of these indicators has been computed over two periods. The first period is 2000-2009, assigning the

average of the competition measure to countrywide data from prior 2010. The second period is 2010 - 2020, also meaning that data between those years is assigned the competition average within that period. It is important to note that some countries have more than one survey dataset between 2010 and 2020; therefore, the number “3” is assigned as the time indicator for the latest dataset. The table below presents the summary statistics of the panel dataset used.

**Table 3: Summary statistics of variables used in the model**

| Variable                  | Observations | Mean   | Std. Dev. | Min    | Max    |
|---------------------------|--------------|--------|-----------|--------|--------|
| Percentage approved       | 70           | 0.155  | 0.097     | 0.013  | 0.414  |
| Lerner                    | 55           | 0.284  | 0.085     | 0.1    | 0.527  |
| Boone                     | 63           | -0.094 | 0.168     | -1.042 | 0.208  |
| H-statistic               | 31           | 0.480  | 0.153     | 0.126  | 0.855  |
| Legal right               | 69           | 5.275  | 2.209     | 2      | 10     |
| Institutional development | 71           | -0.575 | 0.434     | -1.340 | 0.699  |
| Credit information        | 69           | 1.067  | 1.938     | 0      | 6      |
| Financial development     | 65           | 0.313  | 0.192     | 0.117  | 0.896  |
| Foreign share             | 55           | 53.317 | 24.741    | 4.25   | 100    |
| Inflation                 | 70           | 9.332  | 11.428    | 0.902  | 91.513 |
| Growth                    | 70           | 4.766  | 1.996     | 0.7054 | 9.779  |
| Log of GDP                | 70           | 23.572 | 1.499     | 20.945 | 26.794 |
| Time                      | 71           | 1.648  | 0.657     | 1      | 3      |

*Source: Global Financial Development database (GFD), Doing Business (DB) database, Worldwide Governance Indicators (WGI) and World Development Indicators (WDI). Definitions available in the appendix.*

### ***Empirical Model***

To understand the impact of bank competition on access to finance on firms at a countrywide level, this paper estimates two regression models. The dependent variable is a percentage value; this value cannot be transferred into a binary variable, which is typically, what similar studies assess (Udell & Popov, 2012; Love & Peria, 2015; Ayalew & Xianzhi, 2018; Moyo & Sibindi, 2020). This is because the study takes as countrywide approach as opposed to assessing the impacts of competition at the firm level.

The dependent variable is therefore the percentage probability of obtaining finance measured by the either the percentage of approved loans per country in the survey year or the percentage firms with existing loans/credit at the time of survey collection. These variables are computed from the World Bank Enterprise Survey, and this paper will indicate which description of the dependent variable is used and interpret accordingly.

The first model is therefore a fractional outcomes regression model, which is static, to assess the impact on the latest cross-sectional data for the 33 countries.

$$\begin{aligned} \text{Pr}(\text{Access to Finance}_i) \\ = \gamma_0 + \gamma_1 \text{Competition}_i + \gamma_2 \text{Legal right}_i \\ + \gamma_3 \text{Institutional development}_i + \gamma_4 \text{Credit information}_i \\ + \gamma_5 \text{Financial development}_i + \gamma_6 \text{Foreign share}_i + \gamma_7 \text{Inflation}_i \\ + \gamma_8 \text{Growth}_i + \gamma_9 \log \text{GDP}_i + \gamma_{10} \text{time} + \varepsilon_i \end{aligned}$$

Where:

- *Competition<sub>i</sub>* is the measure of competition indicated by the Lerner index, Boone indicator or the H-statistic (GFD)
- *Legal right<sub>i</sub>* accounts for the degree to which collateral and bankruptcy laws protect the right of borrowers and lenders (DB)
- *Institutional development<sub>i</sub>* is the composite index of governance indicators including control of corruption, political stability and absence of violence, regulatory quality and rule of law (WGI)
- *Credit information<sub>i</sub>* is the measure of the coverage, scope and accessibility of credit information in a country accessible either through a public credit registry or private credit bureau (DB)
- *Financial development<sub>i</sub>* is the ratio of domestic credit to the private sector to GDP (GFD)
- *Foreign share<sub>i</sub>* is the percentage ratio of the number of foreign owned banks to the number of the total banks in an Economy (GFD)
- *Inflation<sub>i</sub>* is the annual rise in the price level (WDI)
- *Growth<sub>i</sub>* is the real growth of GDP (WDI)
- *logGDP<sub>i</sub>* is the log of GDP (WDI)
- *time* accounts for the survey time differences across the different countries
- $\varepsilon_i$  is a non-zero residual variable containing both conditional error and time invariant unobservables

The study will further use a static model of the Generalized Estimating Equation in order to assess the impact of banking sector competition on access to finance, this is to assess the unbalanced panel data set. The model is as stipulated below:

$$\begin{aligned} \text{Pr}(\text{Access to Finance}_{it}) \\ = \gamma_0 + \gamma_1 \text{Competition}_{it} + \gamma_2 \text{Legal right}_{it} \\ + \gamma_3 \text{Institutional development}_{it} + \gamma_4 \text{Credit information}_{it} \\ + \gamma_5 \text{Financial development}_{it} + \gamma_6 \text{Foreign share}_{it} + \gamma_7 \text{Inflation}_{it} \\ + \gamma_8 \text{Growth}_{it} + \gamma_9 \log \text{GDP}_{it} + \varepsilon_i \end{aligned}$$

The correlation matrix displayed below shows that there is limited significant multi-collinearity between the explanatory variables as majority of the relationships are below 0.5. The

correlation matrix will also be useful in interpreting the results as some outcomes may give the impression of multi-collinearity, and this table will be support or dispute that inference.

The only strong link that is present is between the variables *percentage approved* and *percentage loaned*. This is relatively coherent as both indicators measure access to finance, with *percentage approved* used as the primary measure for access to finance in our analysis. The *percentage loaned* variable is used to check for the robustness in our estimates as it measures what percentage of firms had a loan or line of credit from a private financial institution at the time of survey collection. It is derived from responses to the questions “*Does the establishment has a line of credit or loan from a financial institution*” and “*What is the type of financial institution that granted the line of credit or loan*”. The two access to finance variables have a correlation of approximately 81% between them, meaning that firms whom already have loans have more prospects to have their loan applications approved.

Furthermore, this indicates that the firms that obtain loans and continue to be approved are already viewed as quality borrowers by banks and may have built a good payment reputation. In addition, since they already have loans they most likely have the necessary documentation and reports, as well as collateral, which has been noted as a significant challenge in accessing finance amongst firms in Africa (Ali & Ali, 2013; Donga, Ngirande & Shumba, 2016). This paper regresses the two variables separately to avoid weakening the statistical power of the model.

**Table 4: Correlation matrix of all**

|                              | percentage<br>approved | percentage<br>loaned | Lerner  | Boone   | H-statistic | legal<br>right | institutional<br>development | credit<br>information | financial<br>development | foreign<br>share | inflation | growth  | log GDP | time   |
|------------------------------|------------------------|----------------------|---------|---------|-------------|----------------|------------------------------|-----------------------|--------------------------|------------------|-----------|---------|---------|--------|
| percentage<br>approved       | 1.0000                 |                      |         |         |             |                |                              |                       |                          |                  |           |         |         |        |
| percentage<br>loaned         | 0.8510                 | 1.0000               |         |         |             |                |                              |                       |                          |                  |           |         |         |        |
| Lerner                       | 0.4459                 | 0.3975               | 1.0000  |         |             |                |                              |                       |                          |                  |           |         |         |        |
| Boone                        | 0.2408                 | 0.2733               | 0.2150  | 1.0000  |             |                |                              |                       |                          |                  |           |         |         |        |
| H-statistic                  | -0.1356                | -0.0769              | -0.3042 | -0.0613 | 1.0000      |                |                              |                       |                          |                  |           |         |         |        |
| legal right                  | 0.0093                 | -0.0492              | 0.3166  | -0.5823 | -0.0467     | 1.0000         |                              |                       |                          |                  |           |         |         |        |
| institutional<br>development | -0.2912                | -0.3858              | 0.0906  | -0.0390 | -0.0862     | 0.2384         | 1.0000                       |                       |                          |                  |           |         |         |        |
| credit<br>information        | -0.1840                | -0.0572              | -0.1327 | 0.0396  | 0.2001      | -0.2711        | 0.2802                       | 1.0000                |                          |                  |           |         |         |        |
| financial<br>development     | -0.2563                | -0.1905              | 0.0816  | 0.1772  | -0.1870     | -0.2647        | 0.5278                       | 0.3458                | 1.0000                   |                  |           |         |         |        |
| foreign<br>share             | -0.1860                | -0.2095              | -0.0981 | 0.5098  | -0.3246     | -0.3034        | -0.1770                      | -0.2337               | 0.0614                   | 1.0000           |           |         |         |        |
| inflation                    | -0.1522                | -0.2645              | 0.2129  | -0.1915 | -0.1578     | 0.2415         | 0.2061                       | 0.0785                | -0.1519                  | -0.1246          | 1.0000    |         |         |        |
| growth                       | 0.2406                 | 0.1691               | 0.3642  | -0.0439 | -0.6069     | 0.3702         | -0.1145                      | -0.3540               | -0.1404                  | 0.2206           | 0.0271    | 1.0000  |         |        |
| log GDP                      | -0.5533                | -0.5403              | -0.1293 | -0.4779 | 0.4329      | 0.1612         | 0.3545                       | 0.4155                | 0.2633                   | -0.4476          | 0.1864    | -0.2153 | 1.0000  |        |
| time                         | -0.1069                | -0.0261              | 0.0669  | -0.2012 | 0.0265      | 0.1500         | -0.0017                      | 0.1485                | -0.0338                  | -0.1751          | -0.0314   | 0.0508  | 0.1905  | 1.0000 |
|                              |                        |                      |         |         |             |                |                              |                       |                          |                  |           |         |         |        |

## 5. Results

### *Cross section and panel data results*

Table 5 below presents results for the cross-section fractional outcomes regression for four alternate model specification. In particular, model 1, model 2 and model 3 each specify one competition variable namely the Lerner, Boone and H-statistic respectively.

**Table 5: Results based on cross-sectional data**

|                           | <b>Model 1</b>       | <b>Model 2</b>       | <b>Model 3</b>        |
|---------------------------|----------------------|----------------------|-----------------------|
| Lerner                    | 0.820***<br>(0.180)  |                      |                       |
| Boone                     |                      | 0.176<br>(0.129)     |                       |
| H-statistic               |                      |                      | 0.202*<br>(0.118)     |
| Legal right               | -0.023***<br>(0.005) | -0.011<br>(0.007)    | -0.015**<br>(0.006)   |
| Institutional development | 0.076***<br>(0.027)  | 0.017<br>(0.043)     | 0.043<br>(0.036)      |
| Credit information        | -0.009<br>(0.007)    | -0.018**<br>(0.009)  | -0.016*<br>(0.009)    |
| Financial development     | -0.004***<br>(0.001) | -0.002<br>(0.002)    | -0.016<br>(0.002)     |
| Foreign share             | -0.001<br>(0.000)    | -0.001**<br>(0.001)  | -0.001**<br>(0.001)   |
| Log of GDP                | -0.037***<br>(0.009) | -0.034***<br>(0.004) | -0.051***<br>(0.0145) |
| Inflation                 | -0.001<br>(0.002)    | 0.004<br>(0.004)     | 0.005<br>(0.004)      |
| Growth                    | 0.008<br>(0.008)     | 0.012<br>(0.011)     | 0.026*<br>(0.014)     |
| time                      | 0.061***<br>(0.018)  | 0.074**<br>(0.03)    | 0.056*<br>(0.032)     |
| <b>Pseudo R-square</b>    | <b>0.07</b>          | <b>0.059</b>         | <b>0.061</b>          |
| Number of observations    | 20                   | 21                   | 21                    |

The corresponding robust standard errors are in parentheses below the marginal effect. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. The fractional outcomes regressions model is used, with the dependent access to finance variable as the probability of loan approvals. A time variable is also included to account for time differences between the surveys. All the values depict the marginal effects.

The aim of model 1, 2 and 3 is to isolate the impacts of each competition measure on access to finance. However, model 2 shows that the Boone indicator is an insignificant explanatory variable for access to finance whilst model 3 shows that the H-statistic is only significant at the 10% confidence level. The best model is model 1 with the Lerner index as the competition measure, followed model 3 with the H-statistic as a measure of competition. This is because model 1 has the highest Pseudo R-squared; Pseudo R-squared gives us an indication of how much the explanatory variables in the model can predict the respondent variable.

The analysis shows that the Lerner index is positively related to the probability of being approved for a loan, it is also significant at the 1% level, meaning that the more concentration there is within the banking sector, is the more likely firms are to get loan applications approved. This infers the information hypothesis. The Boone indicator is positive but not significant, whilst the H-statistic is consistently positive and significant at the 10% level. The H-statistic suggest the transmission of input prices on bank's revenues, respectively, implying that competition induces higher chances of obtaining access to finance. However, scholars argue that the interpretation of the H-statistic is not simply the direction of the relationship between two variables, but the magnitude is also important. The marginal effects of the Lerner index are higher than the marginal effects of both the Boone indicator and H-statistic.

Some of the other explanatory variables also have significant relations to access to finance. The results show that although the GDP of a country has a negative relationship with the probability of access to finance, an increase in the real growth of GDP results in an increase in the probability of access to finance among African countries. The relationship between GDP is significant across all three models whilst the relationship between real growth and access to finance is only significant on the third model. This may mean that, in Africa, firms situated in countries with higher GDP do not necessarily have better chances for receiving loans but those in growing countries do.

The institutional development is also positively related to access to finance and is significant at the 1% level on model 1 whilst the financial development is negatively related to access to finance at the 1%. However, the marginal effects of is relatively low as a one percent increase in the percentage of private credit to GDP only results in a 0.004 decrease in the probability of access to finance amongst African countries.

However, the results show that credit information is also a significant explanatory variable of access to finance in model 2 and 3, at the 5% and 10% significance level, respectively. This is inconsistent with the information hypothesis that has been inferred by the result of the Lerner index. According to the information hypothesis, the less the information asymmetry should be the more firms have access to finance.

Table 6 below present results for the panel generalized estimation equation model for three alternate model specifications. The generalized estimation equation model has been selected because the dependent variable is a probability that is not easily translated into either a binary

or a categorical variable. Furthermore, this estimation technique is useful for unbalanced panel data, which is what has been used in this study.

Similar to the results of the cross-sectional data, model 1, 2 and 3 of Table 6 only include one competition measure. All competition measures are significant across all three models. This may be because panel datasets are more efficient and have less heterogeneity, they also have more data and variance to infer more robust results than cross-sectional data.

**Table 6: Results based on panel data**

|                           | <b>Model 1</b>       | <b>Model 2</b>       | <b>Model 3</b>       |
|---------------------------|----------------------|----------------------|----------------------|
| Lerner                    | 0.618***<br>(0.136)  |                      |                      |
| Boone                     |                      | 0.184**<br>(0.081)   |                      |
| H-statistic               |                      |                      | 0.242**<br>(0.119)   |
| Legal right               | 0.001<br>(0.002)     | 0.004<br>(0.005)     | -0.007***<br>(0.003) |
| Institutional development | -0.031<br>(0.029)    | -0.022<br>(0.053)    | -0.018<br>(0.056)    |
| Credit information        | 0.010***<br>(0.004)  | -0.001<br>(0.005)    | -0.000<br>(0.006)    |
| Financial development     | 0.002*<br>(0.001)    | 0.001<br>(0.002)     | 0.003<br>(0.002)     |
| Foreign share             | -0.002***<br>(0.000) | -0.002***<br>(0.000) | -0.002***<br>(0.000) |
| Log of GDP                | -0.037***<br>(0.007) | -0.028***<br>(0.007) | -0.062***<br>(0.010) |
| Inflation                 | -0.003***<br>(0.001) | -0.002***<br>(0.001) | 0.000<br>(0.002)     |
| Growth                    | 0.008***<br>(0.003)  | 0.011**<br>(0.005)   | 0.036***<br>(0.008)  |
| <b>Wald Chi 2</b>         | <b>2286.52***</b>    | <b>105.45***</b>     | <b>533.93***</b>     |
| Number of Observations    | 44                   | 45                   | 27                   |
| Number of Groups          | 23                   | 24                   | 20                   |

The corresponding robust standard errors are in parentheses below marginal effects. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. The generalized estimation technique is used, with the dependent access to finance variable as the probability of loan approvals. All the values are marginal effects, the marginal value for Financial Development is very small (less than 0.000) hence it displays as zero in the results.

Given that the data used is a panel, the results are more efficient as they have less heterogeneity and are more variable than the cross sectional dataset. The results are for the Lerner index, Boone indicator, and H-statistic are all significant at the 1%, 5% and 5% significance level respectively. All the indicators are have a positive relationship with access to finance, alluding to a positive relationship between concentration and access to finance, over time. It is clear that the Lerner index and Boone indicator show that banks are able to charge above their marginal costs and there is weak reallocation of profits to more competitive banks, suggesting that the information hypothesis holds. Given the low marginal effects of the H-statistic, it can also be argued that there is low transmission of input prices on a firms' revenue. This also supports the information hypothesis.

There also exists a positive relationship between the real growth of GDP and access to finance. The foreign share of banks is negatively related to access to finance, meaning that if the share of foreign owned banks increases then the probability of access to finance decreases. Furthermore, there also exists a negative relationship between the legal right and access to finance.

Despite the results inferring the information hypothesis, the results show a significant positive relationship between access to finance and credit information for the first model only. Therefore, this paper will go on to account for information asymmetry in banking to assess how it affects access to credit. The objective is to find out how competition affects access to finance if information asymmetry on the credit information of firms is low.

### ***Results accounting for information asymmetry***

This paper therefore interacts each competition indicator by the credit information variable, this is only done for the panel dataset as it is more robust than the cross sectional data. These interactions are captured in Table 7 below.

**Table 7: Panel results with interaction terms**

|                           | <b>Model 1</b>       | <b>Model 2</b>       | <b>Model 3</b>      |
|---------------------------|----------------------|----------------------|---------------------|
| Lerner                    | 0.446***<br>(0.149)  |                      |                     |
| Boone                     |                      | 0.290***<br>(0.076)  |                     |
| H-statistic               |                      |                      | 0.282***<br>(0.076) |
| Legal right               | -0.006***<br>(0.002) | 0.004<br>(0.003)     | -0.002<br>(0.003)   |
| Institutional development | -0.040<br>(0.028)    | -0.071**<br>(0.034)  | -0.025<br>(0.024)   |
| Credit information        | -0.174***<br>(0.056) | -0.227***<br>(0.055) | -0.122**<br>(0.061) |
| Financial development     | -0.001***<br>(0.001) | -0.001<br>(0.000)    | 0.001<br>(0.001)    |

|                        |                      |                      |                      |
|------------------------|----------------------|----------------------|----------------------|
| Foreign share          | -0.002***<br>(0.000) | -0.003***<br>(0.000) | 0.003***<br>(0.000)  |
| Log of GDP             | -0.050***<br>(0.006) | -0.039***<br>(0.08)  | -0.072***<br>(0.006) |
| Inflation              | -0.005***<br>(0.002) | -0.005***<br>(0.002) | -0.001<br>(0.002)    |
| Growth                 | 0.009***<br>(0.009)  | 0.006*<br>(0.003)    | 0.024***<br>(0.007)  |
| lerner_credit_info     | 0.460***<br>(0.147)  | 0.624***<br>(0.132)  | 0.419***<br>(0.141)  |
| boone_credit_info      | -0.196**<br>(0.079)  | -0.326***<br>(0.080) | -0.088<br>(0.079)    |
| hstat_credit_info      | 0.088***<br>(0.031)  | 0.082**<br>(0.033)   | 0.026<br>(0.038)     |
| <b>Wald Chi 2</b>      | 99959.93***          | 3137.03***           | 640.98***            |
| Number of Observations | 26                   | 26                   | 26                   |
| Number of Groups       | 19                   | 19                   | 19                   |

The corresponding robust standard errors are in parentheses below marginal effects. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. All the values depict marginal effects, the marginal value for some variables is very small (less than 0.000) hence it displays as zero in the results.

Considering credit information given the level of concentration allows the model to account for the conditional effect of decreasing information asymmetry. Taking into account these interactions between credit information and competition measures makes the availability of better credit information a significant negative determinant of access to credit.

From the results, it is evident that this interaction is insignificant for the Lerner index and Boone indicator at a 1% confidence level. It is not significant with the H-statistic. This interaction is positive for the Lerner index and negative for the Boone indicator. However, it is useful to analyse the net effects for each competition measure.

The net effect of the interacting the Lerner index and credit information (model 1) is 0.031 ( $[0.460 \times 0.446] + [-0.174]$ ), with -0.174 being the unconditional effect of credit information and 0.446 as the average value of competition according to the Lerner index computation. Therefore, credit information and the Lerner index have a positive relationship to access to finance. This means that having a more concentrated banking sector as well as more credit information increases the probability of accessing finance.

The net effects of the interaction of the Boone indicator and credit information (model 2) is -0.284 ( $[-0.196 \times 0.290] + [-0.227]$ ), with -0.227 being the unconditional effect of credit information and 0.290 as the average value of competition according to the Boone indicator computation. Credit information and the Boone indicator have a negative relationship with access to finance. This means that a banking system with weaker reallocation of profits to more competitive banks as inferred by a positive Boone indicator unconditional effects, as well as less credit information inferred by negative credit information unconditional effects results in less access to finance.

Similar to the results excluding interactions between competition and credit information, inflation and the log of GDP are negatively and significantly related to access to finance. For inflation, this means higher prices reduce the probability of access to finance. With GDP, this means that the higher the GDP of a country, then the less access to finance firms have. However, as is the case without looking at credit information, the growth in the real GDP of a country induces better chances of obtaining access to credit.

### Robustness check

In order to check whether these relationships hold, this paper makes use of the percentage of firms had a loan or line of credit from a private financial institution at the time of the survey as the dependent variable. This can be seen in the table below.

**Table 8: Cross-sectional and Panel results for percentage of loans.**

|                           | Model 1              | Model 2              | Model 3              |
|---------------------------|----------------------|----------------------|----------------------|
| Lerner                    | 0.359*<br>(0.195)    |                      |                      |
| Boone                     |                      | 0.382***<br>(0.080)  |                      |
| H-statistic               |                      |                      | 0.426***<br>(0.114)  |
| Legal right               | 0.009*<br>(0.004)    | 0.019***<br>(0.005)  | 0.011***<br>(0.003)  |
| Institutional development | -0.195***<br>(0.052) | -0.221***<br>(0.051) | -0.153***<br>(0.049) |
| Credit information        | -0.110<br>(0.079)    | -0.144**<br>(0.070)  | 0.018<br>(0.079)     |
| Financial development     | 0.000<br>(0.002)     | 0.001<br>(0.001)     | 0.003***<br>(0.001)  |
| Foreign share             | -0.004***<br>(0.000) | -0.004***<br>(0.000) | -0.004***<br>(0.000) |
| Log of GDP                | -0.094***<br>(0.008) | -0.075***<br>(0.009) | -0.120***<br>(0.007) |
| Inflation                 | -0.006**<br>(0.003)  | -0.007***<br>(0.002) | -0.001<br>(0.002)    |
| Growth                    | 0.005<br>(0.007)     | 0.001<br>(0.006)     | 0.027***<br>(0.006)  |
| lerner_credit_info        | 0.426**<br>(0.191)   | 0.534***<br>(0.168)  | 0.216<br>(0.176)     |
| boone_credit_info         | 0.090<br>(0.104)     | -0.076<br>(0.099)    | 0.259***<br>(0.083)  |
| hstat_credit_info         | 0.064<br>(0.045)     | 0.040<br>(0.041)     | -0.052<br>(0.055)    |
| <b>Wald Chi 2</b>         | <b>4883.78***</b>    | <b>7037.70***</b>    | <b>2897.32***</b>    |
| Number of Observations    | 26                   | 26                   | 26                   |
| Number of Groups          | 19                   | 19                   | 19                   |

The corresponding robust standard errors are in parentheses below marginal effects. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . The dependent variable is the proportion of firms that have a loan at the time of survey collection for the assessed African countries. All the values depict marginal effects, the marginal value for some variables is very small (less than 0.000) hence it displays as zero in the results.

The relationships inferred by the results in Table 8 are still consistent with those that were concluded before using the percentage of approvals. All the measures of competition are related to access to finance in the same direction, meaning that the information hypothesis still holds.

In addition, the relationship with GDP, growth, and foreign share remain significant. This verifies the robustness of the analysis. However, the relationship between the protection of legal rights and access to finance are now positively related to access to finance. This may mean that the stronger the rights of borrowers of lenders in a country is the more chances that firms will actually have a line of credit as opposed to just being approved for a loan.

Overall, the effect of competition on access to finance is negative as the different measures of competition all show that concentration improves the chances of firms obtaining finance in African countries. This is similar to the results by scholars such as Hoxha, 2013 and Ayalew and Xianzhi, 2018. The Lerner index and Boone indicator suggest that the information hypothesis holds whilst at face value, it can be argued that the positive H-statistic alludes to the market power hypothesis. However, the low marginal effects of the H-statistic indicate low transmission of input prices on firms' revenue.

However, theoretical contributions on the Lerner index show that there are possible cases whereby the difference between price and marginal cost reduces with more concentration (Stiglitz, 1987; Bulow and Klemperer, 2002). Literature that is more recent shows that even if individual Lerner indices decrease with competition, the reallocation effect may cause the average degree of market power to increase, decrease or remain stable (Boone, 2008). The reallocation effect means that since firms that are more efficient have higher price-cost margins, a large enough increase in the market share of the more efficient firms can result in a higher weighted average Lerner index even with increase concentration. However, given that the Lerner index, Boone indicator and arguably the H-statistic allude to the information hypothesis, the results of the Lerner index are relatively robust.

The interaction between the Lerner index and credit information shows a significant relationship to access to finance, meaning that more concentrated business environments with stronger credit information increase the probability of loan approvals. Similarly, the interaction between the Boone indicator and credit information shows that weak reallocation of profits to more competitive banks and low levels of credit information in a country in Africa reduces the chances of access to finance. The interaction between credit information and the H-statistic is insignificant, however in the presence of the interaction credit information negatively relates to access to finance.

## 5. Conclusions and policy recommendations

A favourable business environment is crucial for the survival and growth of firms, and one of the key factors that form part of the business environment is access to finance. A key provider for finance in Africa is private commercial banks; however, there are a number of factors that may influence the supply and cost of finance to businesses by these banks. One such factor is the bank concentration but literature has contradicting predictions on the direction of those factors (Beck, Demirgüç-Kunt & Maksimovic, 2003).

Some studies infer the market power hypothesis (Rice and Strahan, 2010; Love and Peria, 2015; Lieberman, 2017) whilst others infer the information hypothesis (Fischer, 2000; Hoxha, 2013; Ayalew & Xianzhi, 2018). The market power hypothesis predicts that higher concentration leads to a reduced supply of loans at a higher interest rate (Beck, Demirgüç-Kunt & Maksimovic 2003). In contrast, accounting for informational asymmetries that may cause moral hazard and adverse selection leads to conjectures that suggest a positive or nonlinear relation between market concentration and loan accessibility for borrowers in a dynamic setting (Love and Peria, 2015).

This study therefore analyses the impact of bank competition on access to credit a countrywide level, on selected African countries. It makes use of data from the WBES to compute a measure of access to finance which is percentage of approved loans in the survey year for each country. The study conducts the analysis on cross-sectional as well as panel data to get more efficient and robust results.

The results of the Lerner index and Boone indicator clearly show a positive relationship between concentration and access to finance, with the Lerner index alluding to the information hypothesis. Although the H-statistic is positive, its' marginal effects on competition are relatively low, supporting the information hypothesis. Interactions between the competition measures and credit information reveal that more concentration within banking and more credit information are positively related to access to finance. Conversely, less credit information and weaker reallocation of profits reduces access to finance within countries in Africa. Overall, the introduction of interaction terms induces a negative significant relationship between credit information and access to finance.

African economies therefore need to improve access to finance by improving information sharing between banks and business owners, more importantly for SMEs. Business support to assist business owners keep more detailed accounts of their books can significantly reduce information asymmetry as well as reduce complexities in loan application (Beck & Cull, 2013; Onubedu & Yusuf, 2018). African banks also have significant resources to be able to increase funding as they are said to be over liquid and well capitalized (Beck & Cull, 2013). Therefore developing African banks can resource banks to better collect information as well as reduce the overall costs and complexity of collating information during the lending process.

In addition, one of the most prevalent reasons for not applying for loans in Africa is high interest rates, therefore improving competition is also useful to induce more borrowing. This

can be done by reducing barriers to entry in the banking sector, competition authorities therefore have an important role to play in monitoring and regulating anti-competitive behaviour of existing banks.

There is also a negative relationship between inflation and access to finance, as well as GDP and access to finance. However, there is a positive relationship between access to finance and real GDP growth in Africa. This means that it is not the countries that have high GDPs that have more access to finance for their business, but rather it is growing countries that display can induce access to finance. It can also be argued that this relationship can be inverted in that the countries, which have higher access to finance, improve GDP growth both in the short and long run as this relationship is present with both panel and cross-sectional results. Therefore, it is important for African economies to work to improve economic growth for more lending.

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## Appendix

**Table A1. Variable Descriptions**

| Variable                                   | Description                                                                                                                                                               | Possible Outcomes                                  | Source       |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------|
| <b><i>Dependent variables</i></b>          |                                                                                                                                                                           |                                                    |              |
| Percentage approved                        | percentage of approved loans per country in the survey year                                                                                                               | Between [0,1]                                      | WBES         |
| Percentage loaned                          | % of firms with existing loans/credit at the time of survey collection                                                                                                    | Between [0,1]                                      | WBES         |
| <b><i>Competition measures</i></b>         |                                                                                                                                                                           |                                                    |              |
| Lerner                                     | Computed value of the Lerner index                                                                                                                                        | Between [0,1] but can exceed 1 in some instances   | GFD database |
| Boone                                      | The value of the Boone indicator                                                                                                                                          | Between [-1,1] but can be below -1 in real markets | GFD database |
| H-statistic                                | The value of the H-statistic is obtained from the Panzar-Rosse model specification                                                                                        | Between [-1,1]                                     | GFD database |
| <b><i>Other explanantory variables</i></b> |                                                                                                                                                                           |                                                    |              |
| Legal right                                | This index accounts for the degree to which collateral and bankruptcy laws protect the right of borrowers and lenders.                                                    | Strength between 0-10                              | DB database  |
| Institutional development                  | The average composite index of governance indicators (control of corruption, political stability and absence of violence, regulatory quality and rule of law).            | Values range between (-2.5 to 2.5).                | WGI          |
| Credit information                         | Measures the coverage, scope and accessibility of credit information in a country, accessible either through a public credit registry or private credit bureau.           | Value between 0-10                                 | DB database  |
| Financial development                      | Domestic credit to the private sector to GDP.                                                                                                                             | Between [0;1]                                      | GFD database |
| Foreign share                              | % of the number of foreign owned banks to the number of the total banks in an Economy. A foreign bank is defined as having 50% or more of its shares owned by foreigners. | Between [0,1]                                      | GFD database |

|                               |                                                                |                                                                                         |     |
|-------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------|-----|
| Log of GDP                    | Log of GDP (Constant USD)                                      | +ve values                                                                              | WDI |
| Inflation                     | Annual change in the GDP deflator                              | Between [0,1]                                                                           | WDI |
| Growth                        | Real growth of the GDP                                         | Between [0,1]                                                                           | WDI |
| time (cross-section analysis) | Time categorical value to account for survey time differences. | 1 for countries surveyed in 2010 - 2012; 2 in 2013-2015; 3 in 2016-2018; 4 in 2019-2020 |     |
| time (panel analysis)         | The order of the survey for each country.                      | can take on values [1,2,3], earliest survey time=1                                      |     |

**Table AII: Results based on cross-sectional data excluding GDP (for collinearity)**

|                           | Model 1              | Model 2             | Model 3             |
|---------------------------|----------------------|---------------------|---------------------|
| Lerner                    | 0.860***<br>(0.280)  |                     |                     |
| Boone                     |                      | 0.199<br>(0.218)    |                     |
| H-statistic               |                      |                     | 0.041<br>(0.109)    |
| Legal right               | -0.029***<br>(0.010) | -0.018*<br>(0.009)  | -0.026**<br>(0.011) |
| Institutional development | 0.068*<br>(0.010)    | 0.006<br>(0.050)    | 0.023<br>(0.052)    |
| Credit information        | -0.012<br>(0.008)    | -0.019**<br>(0.009) | -0.021**<br>(0.010) |
| Financial development     | -0.006***<br>(0.001) | -0.004<br>(0.002)   | -0.004**<br>(0.002) |
| Foreign share             | -0.000<br>(0.001)    | -0.001<br>(0.001)   | -0.001<br>(0.001)   |
| Growth                    | 0.009<br>(0.012)     | 0.016<br>(0.014)    | 0.018<br>(0.016)    |
| Inflation                 | -0.001<br>(0.003)    | 0.003<br>(0.004)    | 0.004<br>(0.004)    |
| time                      | 0.030<br>(0.025)     | 0.037<br>(0.03)     | 0.041<br>(0.029)    |
| <b>Psuedo R-square</b>    | <b>0.054</b>         | <b>0.042</b>        | <b>0.039</b>        |
| Number of observations    | 20                   | 21                  | 21                  |

The corresponding robust standard errors are in parentheses below marginal effects. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . The generalized estimation technique is used, with the dependent access to finance variable as the probability of loan approvals. All the values are marginal effects, the marginal value for Financial Development is very small (less than 0.000) hence it displays as zero in the results.

**Table AIII: Results based on cross-sectional data excluding growth (for collinearity)**

|                           | <b>Model 1</b>       | <b>Model 2</b>      | <b>Model 3</b>      |
|---------------------------|----------------------|---------------------|---------------------|
| Lerner                    | 0.754***<br>(0.225)  |                     |                     |
| Boone                     |                      | 0.098<br>(0.165)    |                     |
| H-statistic               |                      |                     | 0.079<br>(0.09)     |
| Legal right               | -0.014***<br>(0.005) | -0.005<br>(0.012)   | -0.005<br>(0.011)   |
| Institutional development | 0.064<br>(0.040)     | -0.004<br>(0.047)   | 0.006<br>(0.044)    |
| Credit information        | -0.004<br>(0.007)    | -0.016*<br>(0.009)  | -0.016*<br>(0.009)  |
| Financial development     | -0.003**<br>(0.001)  | -0.001<br>(0.002)   | -0.001<br>(0.002)   |
| Foreign share             | -0.001<br>(0.000)    | -0.001<br>(0.001)   | -0.001**<br>(0.001) |
| Log of GDP                | -0.037***<br>(0.008) | -0.031**<br>(0.015) | -0.038**<br>(0.017) |
| Inflation                 | -0.004<br>(0.003)    | 0.001<br>(0.004)    | 0.002<br>(0.004)    |
| time                      | -0.002<br>(0.021)    | 0.013<br>(0.033)    | 0.012<br>(0.032)    |
| <b>Pseudo R-square</b>    | <b>0.063</b>         | <b>0.047</b>        | <b>0.047</b>        |
| Number of observations    | 20                   | 21                  | 21                  |

The corresponding robust standard errors are in parentheses below the marginal effect. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . The fractional outcomes regressions model is used, with the dependent access to finance variable as the probability of loan approvals. A time variable is also included to account for time differences between the surveys. All the values depict the marginal effects.

**Table AIV: Results based on panel data excluding growth (collinearity)**

|                           | Model 1              | Model 2              | Model 3              |
|---------------------------|----------------------|----------------------|----------------------|
| Lerner                    | 0.661***<br>(0.126)  |                      |                      |
| Boone                     |                      | 0.174**<br>(0.088)   |                      |
| H-statistic               |                      |                      | -0.034<br>(0.080)    |
| Legal right               | 0.001<br>(0.002)     | 0.005<br>(0.006)     | 0.003<br>(0.004)     |
| Institutional development | -0.042<br>(0.030)    | -0.024<br>(0.038)    | -0.104*<br>(0.059)   |
| Credit information        | 0.011***<br>(0.004)  | -0.003<br>(0.006)    | 0.002<br>(0.006)     |
| Financial development     | 0.002<br>(0.001)     | -0.000<br>(0.002)    | 0.002<br>(0.002)     |
| Foreign share             | -0.002***<br>(0.000) | -0.002***<br>(0.001) | -0.002***<br>(0.000) |
| Inflation                 | -0.003***<br>(0.001) | -0.002***<br>(0.001) | -0.002<br>(0.003)    |
| Log of GDP                | -0.040***<br>(0.007) | -0.028***<br>(0.008) | -0.057***<br>(0.012) |
| <b>Wald Chi 2</b>         | <b>844.09***</b>     | <b>53.72***</b>      | <b>273.64***</b>     |
| Number of Observations    |                      | 44                   | 45                   |
| Number of Groups          |                      | 23                   | 24                   |

The corresponding robust standard errors are in parentheses below marginal effects. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. The generalized estimation technique is used, with the dependent access to finance variable as the probability of loan approvals. All the values are marginal effects, the marginal value for Financial Development is very small (less than 0.000) hence it displays as zero in the results.

**Table V: Panel results with interaction terms excluding growth (for collinearity)**

|                           | Model 1              | Model 2              | Model 3              |
|---------------------------|----------------------|----------------------|----------------------|
| Lerner                    | 0.547***<br>(0.163)  |                      |                      |
| Boone                     |                      | 0.283**<br>(0.149)   |                      |
| H-statistic               |                      |                      | 0.056<br>(0.122)     |
| Legal right               | 0.003<br>(0.002)     | 0.006<br>(0.005)     | 0.002<br>(0.004)     |
| Institutional development | -0.002<br>(0.023)    | -0.019<br>(0.040)    | -0.045<br>(0.035)    |
| Credit information        | -0.022<br>(0.015)    | -0.013*<br>(0.014)   | 0.025**<br>(0.021)   |
| Financial development     | -0.001***<br>(0.001) | 0.000<br>(0.001)     | 0.002<br>(0.002)     |
| Foreign share             | -0.002***<br>(0.000) | -0.002***<br>(0.001) | -0.002***<br>(0.000) |
| Log of GDP                | -0.043***<br>(0.007) | -0.020<br>(0.015)    | -0.059***<br>(0.013) |
| Inflation                 | -0.002***<br>(0.001) | -0.002***<br>(0.001) | -0.001<br>(0.002)    |
| lerner_credit_info        | 0.136**<br>(0.055)   |                      |                      |
| boone_credit_info         |                      | -0.076<br>(0.084)    |                      |
| hstat_credit_info         |                      |                      | 0.045<br>(0.035)     |
| <b>Wald Chi 2</b>         | <b>6135.84***</b>    | <b>69.63***</b>      | <b>416.39***</b>     |
| Number of Observations    | 44                   | 26                   | 27                   |
| Number of Groups          | 23                   | 19                   | 20                   |

The corresponding robust standard errors are in parentheses below marginal effects. \*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1. All the values depict marginal effects, the marginal value for some variables is very small (less than 0.000) hence it displays as zero in the results.