UNIVERSITY OF
KWAZULU-NATAL

INYUVESI
YAKWAZULU-NATALI

An analysis of bank competition and financial stability: Evidence from the South African banking sector

A research thesis submitted in fulfilment of the requirements for the degree

Master of Commerce (Economics)

By

Mzamo Perceviere Vilakazi

210552512

Supervisor: Professor Paul-Francois Muzindutsi

Co-supervisor: Dr. Ayanda Meyiwa

July 2021

DECLARATION

I declare that this dissertation titled

An analysis of bank competition and financial stability: evidence from the South African banking sector,

My work, except where indicated, and all the resources used or quoted have been densely acknowledged through in-text and complete references via reference list. I have not previously submitted the dissertation for a degree at any other university.

… [redacted] …… 08 07 2021

Mzamo Perceviere Vilakazi

June 2021

Durban

South Africa

DEDICATION

This dissertation is devoted to my late parents, Thandekile Vilakazi and Dumisani Makhanya, for their prayers and the opportunity to bring me on this earth.

ACKNOWLEDGEMENTS

I would first like to appreciate the strength and will to complete this dissertation from God. He is the way, truth, and life.

I would also like to express my sincere gratitude to the following people, without their assistance, completing this dissertation would not have been possible.

- Muzindutsi, for his support and expertise, particularly with econometrics aspects of the dissertation, and my co-supervisor, Dr. A. Meyiwa, for help and guidance towards completing this study for his additional advice and support.
- My family, my aunty, Theresa Vilakazi, and uncle Bongani Vilakazi, for upbringing me and further assistance towards completing my higher education.
- My friends for their support and guidance on financial data collection.
- Last but not least, my gratitude goes to my fiancée Busisiwe, and thank God for our beautiful kids Malwande, Ntokozo, and Nhlalwenhle.

ABSTRACT

There is a crucial role that the banking in terms of play and serve as central to the economy. Thus, competition is vital to the banking industry. However, while competition is perceived to be vital to the banking industry, it is claimed to have both positive and negative implications on the financial stability of banks. This study investigated the link between bank competition and financial stability in South Africa. The study utilized panel regression to examine the associations between different measures of bank competition and financial stability for the major five banks over the sample period spinning from 2009 to 2019. This study employed three different models namely, the Boone indicator, Lerner index, and fluctuating H-statistics to test for bank competition theories. The study further investigated the level of competition in the South African banking sector by unpacking the concept of concentration in the South African banking sector, using Concentration Ratios (CR) and Herfindahl-Hirschman Index (HHI). The study used the Z-score and profitability as dependent variables to proxy for financial stability in the banking sector. The economic activity and the bank size were used as the control variables in the competition and stability models to account for any uncounted variables. The findings indicated that less competition in the banking market causes banks to engage in risky activities, face regulatory intervention, or, worse, fail, consistent with the competition stability hypothesis. Furthermore, more competition and access to related financial services can be applauded to produce a competing environment in the South African banking services industry. Overall, this study concluded by supporting that more competition enhances financial stability.

Key words: *Bank Competition, Banking Sector, Concentration Ratios, Financial Stability, Z-score.*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

Banking Association of South Africa (BASA)

Boone Indicator (BI)

Certificates of Deposit (CDs)

Complete Industrial Concentration Index (CICI)

Concentration Ratio (CR)

Democratic Republic of the Congo (DRC)

Efficient Structure (ES)

Entropy Calculation Index (ECI)

First National Bank (FNB)

General Least Squares (GLS)

Gross Domestic Product (GDP)

Gulf Cooperation Council (GCC)

Herfindahl Hirschman index (HHI)

Hall-Tideman Index (HTI)

Hannah and Kay Index (HKI)

Hausa Addictive Index (ha)

Industrial Organization (IO)

International Monetary Fund (IMF)

Marginal Cost (MC)

Multiplicative Haus Index (Hm)

New Empirical Industrial organization (NEIO)

Net Interest Margin (NIM)

Ordinary Least Squares (OLS)

Organization for Economic Cooperation and Development (OECD)

Panzar-Rosse (PR)

Return on Investment (ROI)

Return on Asset (ROA)

Return on Equity (ROE)

Rosenbluth Index (RI)

South African Reserve Bank (SARB)

Southern African Development Community (SADC)

Statement of Comprehensive Income (SOCI)

Standard Bank (SBK)

Structure-Conduct-Performance (SCP)

Total Cost (TC)

U Index (UI)

United Kingdom (UK)

Zigraiova and Havranek's (ZandH)

CHAPTER 1: INTRODUCTION

1.1 Background

The banking sector is pivotal to economic activity, including assembling savings and direct those savings to productive sectors (Doll, 2010). This will encourage the well-organized distribution of resources (Levine, 2004; Bodie and Merton, 2005). The competitive nature of the environment in which the banking sector operates is fundamental as suggested by Bodie and Merton (2005). Doll (2010) further claimed that, the financial system comprises various structures, including financial institutions, financial markets, and infrastructure arrangements (such as the clearing and settlement systems). However, this study emphases are only the financial institutions, precisely banks. When a banking system lacks functioning well, there is a potential for economic instability as proposed by Reinhart and Rogoff (2009b), and this study aims to evaluate the link between bank competition and financial stability. Competition is the key to robust and effective markets since it encourages firms to innovate, boosts productivity, and results in inefficient resource allocation (Levine, 2004). A competitive environment promotes fairness amongst competing companies and enables businesses to give the best possible range of goods and services at the best possible prices (Levine, 2004). For those reasons above, the competition is regarded as the essential motive for productivity growth in any economy. Furthermore, to enhance quality, competition creates a broader choice for consumers. Therefore, by removing distortions to competition, we will reduce opportunities for corruption and rent-seeking, thus helping markets work better and maximize economic benefits.

The South African banking industry is operating under the South African Reserve Bank (SARB). The SARB is the central prudential bank of South Africa with a Supervision department, which has the regulatory and authority over the banking industry. According to SARB, as of the end of December 2018 financial year, 36 banks in South Africa were made up of 33 commercial banks and three mutual banks (South African Reserve Bank, 2019). Of these overall banks, only 17 are locally owned, and 15 branches belong to foreign banks (Rapapali and Simbanegavi, 2020). However, there are non-building societies that exist. The overall assets of the sector (domestic and foreign-owned) amounted to R5 trillion in 2018, which shows an increase from R3,2 trillion in 2008 (South African Reserve Bank, 2019). There are also 47

representative offices of foreign banks (South African Reserve Bank, 2019). The banks in liquidation or curatorship were excluded, and mutual banks with lower capital requirements (Rapapali and Simbanegavi, 2020).

The recent empirical question of whether concentration results in inflated prices as per the above paragraph (Simatele, Mishi, and Ngonyama, 2018). When the answer is yes, it is necessary to deny mergers and vote against larger banks (Simatele, Mishi, and Ngonyama, 2018). In contrast, concentration has no positive correlation to profitability and by inference prices. Thus, breaking down large banks will result in inflated prices and a small consumer surplus (Simatele, Mishi, and Ngonyama, 2018). The next paragraph discusses the measures that were taken by the government in reviewing the regulations to prioritize prudent and market conduct control.

The South African managing an account framework was designed, controlled, and distinguished by inflated and smeared fees (National Treasury, 2011). Hence, the government has resorted to reviewing the regulations to prioritize prudent and market conduct control when presenting the "Twin Crests model" of financial sector regulation (National Treasury, 2011). The latest framework emphasizes more competition and discourages bank charges (Simatele, 2015; Simbanegavi et al., 2015). Given the empirical evidence produced by academic writers such as Simatele (2015), Simbanegavi *et al.* (2015), Mlambo and Ncube (2011), and Okeahalam (2001) on the conduct performance of the South African banks. Mlambo and Ncube's (2011) analysis further included efficiency following the inquiry commissioned by in 2004 government regarding the type of competition in South Africa. The report from the authorized investigation, justified using index measures such as Herfindahl Hirschman Index (HHI), indicated extreme concentration levels in the South African banking sector. The two arguments of the competition were analyzed by researchers such as Okeahalam (2001; 2004). The first argument suggested that concentration results in uncompetitive prices. When this relationship is genuine, it means demolishing big banks and denying mergers is essential. The second argument indicates that a correlation between concentration and profitability by inference prices is negative, meaning collapsing large banks may inflate costs and inefficiencies (such as reduced consumer surplus) Demirgüç-Kunt and Detragiache (2000). Further, the general findings that the South African banking sector is characterized by monopolistic competition have been brought to attention by the competition commission inquiry if the price-fixing behaviour in foreign exchange trading within different South African banks (Competition Commission South Africa, 2017).

The overarching critical trend that impacted the banking sector over the last decade is the significant expansion in access to a bank account in South Africa. Typically, access to bank accounts rose in 2005 from less than 50 percent for adults to almost 75 percent in 2018. Even though this results from the improved standards of living over time and the Financial Sector Charter process in 2014, expanding competition in the banking sector likely resulted in lower prices, more innovation, and greater inclusion (Finscope, 2018). The utilization of the Mzansi Account increased at most about 15 percentage of South African Adults in 2017 (Finscope, 2018). The success of the banking inquiry that requested competition improvement and access to the banking sector in South Africa has created room for recommendations that were implemented, such as cash withdrawal from tills and reduction in penalty fees (Ilesanmi and Tewari, 2019).

This study investigates the relationship between bank competition and bank financial stability. Some researchers, such as Cihak *et al*. (2006); Bikker and Spierdijk (2009); Carbó *et al.* (2009); Wibowo (2017), have generally concluded that competition is one of the critical role players towards combating poverty. This view is supported by Mlambo and Ncube (2011); Simatele (2015); Boyd and De Nicoló (2005); and Boyd *et al.* (2009) who claimed that bank competition enhances the poor's benefit to save, provide an incentive to gain essential credit and insurance. This manner grants them a chance to contribute to economic growth that further assists in achieving stable consumption while maintaining financial stability. Furthermore, Cihak *et al.* (2006) and Wibowo (2017) claimed in their research studies that the presence of competition makes the cost of financing lower, thus expanding the availability of financial services to both the banks and clients, which gives an idea of a significant link between competition in the banking sector and financial stability. For instance, in most countries, the impact of bank competition is not only limited to the bank's performance, but it expands to both the stability (Cihak *et al.*, 2006; Wibowo, 2017) and economic growth (Colander and Shaffer, 2003; Wibowo, 2017). Further, competition affects monetary policy efficiency instituted and provided by the central bank (De Jonghe and Vennet, 2008) and the real sector (Carbó *et al.*, 2009).

The correlation between bank competition and financial stability is complex as competition may positively or negatively affect it (Beck, 2008). Studies by Carletti and Hartman (2003); Beck (2008), and Vives (2011) provides empirical results regarding both the above referred to as positive and negative effects. This concludes that the comprehension behind the

consequences of competition on financial stability nexus remains the issue of concern among policymakers and academics (Tucker, 2015; Bank of England, 2015; Dickinson *et al.*, 2015).

Overview of South African Commercial Banks Competition

The argument made by Kabir and Worthington (2015) claimed that banking sector market power in South Africa might pose either a positive or negative impact on stability, depending on the type of competition that exists. Thus, these findings justify the competition fragility/stability views for banking systems and support the conclusions of Ariss (2010) and Dima *et al.* (2014). Additonally, Boyd and De Nicolo (2005) argued that the banking sector is crucial for the health of the entire economy. The South African Reserve Bank presents a primary objective of the central bank of the Republic of South Africa, which is to accomplish and keep price stability in the interest of stable and viable economic growth in S.A. (Falkena *et al.* 2001). The committee of the central bank of the Republic of South Africa is obliged to contribute to the bank's financial stability objective (SARB, 2008), including the central bank itself.

Further, Kabir and Worthington (2015) noted that concentration might be socially efficient for competition, even though stability may be socially undesirable. Therefore, this trade-off is good only when it symbolizes a rise in the coincident economic indicator. For instance, the gross domestic product (GDP), since this signifies economic growth and the strengthening of financial stability (Kabir and Worthington, 2015), means that it is essential to understand the causes of decline in economic activity when competition increases or decreases (Hope *et al.* 2004). The above discussion is possible by understanding the two competing theories of fragility and stability (Kabir and Worthington, 2015). The two competing arguments are supported in a study by Repullo (2004), which implies that a rise in competition could reduce the franchise value of a bank and results in an increased risk of their profit margin. In contrast, Hisks (1935), Liebenstein (1966), Demsetz (1973), Peltzman (1977), claimed that when competition is low, banks would be more stable and engage in fewer risky activities. This explains the relationship between bank competition and efficiency (Hisks, 1935; Liebenstein 1966; Demsetz, 1973; Peltzman, 1977).

Also, a study by Hellmann, Murdock and Stiglitz (2000) stated that competition is generally an incentive to achieve efficiency, consumer choice, quality of goods and services, low prices,

and innovation. This indicated the degree of how universally intense competition is to all industries and not only to financial institutions. Therefore, many factors need to be taken into consideration when analysing competition including, but not limited to incentives to save and invest, cost of financial intermediation, the distribution of resources, the fluctuating and allocation of risk, the discipline enforced on borrowers by the lenders of funds, the efficiency and total performance of the economy may be impaired (Hellmann, Murdock, and Stiglitz, 2000).

Hellmann *et al*. (2000) further claimed that the authorities generally base their focal judgment of the banking industry competition on excess returns earned by banks. Excess returns refer to the rate of return on equity (ROE) above the standard rate of return essential in the long run to compensate investors (Hellmann *et al.*, 2000). This ensures an adequate provision of capital funds when necessary, as empirically shown in a study by Davel *et al*. (2008), how central the banking system is to the economy. Thus, when the central bank is in jeopardy, the same factors such as incentives to save and invest, cost of financial intermediation, the distribution of resources, the fluctuating and allocation of risk, the discipline enforced on borrowers by the lenders of funds, the efficiency and total performance of the economy may be impaired (Falkena *et al.*, 2001). Evidence from a study by Boyd and De Nicolo (2005) indicated that a similar case might arise when a bank system does not price risk efficiently.

As a result, many studies have tested the impact and types of competition in the banking sector, but very few analysed the effect of competition on financial stability in the South African context. For instance, studies by Simbanegavi *et al.* (2015), Mlambo and Ncube (2011), Simatele (2015) evaluated competitive conditions in the banking sector of South Africa. They reached a common conclusion that the type of competition that exists is monopolistic. Following Allen and Gale (2004), the problem of an adverse effect of competition, identical to financial instability, lack of economic growth is a priority in the light of the South African government's analysis, identifying, monitoring, and acting to settle or eradicate systematic risks, to protect and enhance the elasticity of the South African financial system. According to Schaeck *et al.* (2008), the type of competition that exists in a banking sector influences financial stability (i.e., less market power in the banking industry may result in a more stable banking system as compared to the banking system under a monopoly with more market power, characterized by full market power). This indicates an obligation that the central bank committee must fulfill by contributing to the central bank's objective of a stable banking system and financial stability (South African Reserve Bank, 2008).

The study commences with a summary of the importance of competition in the banking sector, followed by a literature review. Lastly, the methodological approaches used in the empirical literature show how these approaches have evolved.

1.2 Problem Statement

An untraceable deregulation process happened in the banking sector three decades before the global financial crisis, which occurred from 2007 to 2009, where efficiency and competition considerations overshadowed financial stability concerns (Vives, 2016). After that, different strands that exist in recent the literature, which needs further analysis to draw a solid conclusion. This is following a statement made by the National Treasury in May 2003, which incorporated a need for a study on the competitiveness of South African banking, that follows a pattern used by the same studies performed abroad (e.g., The Cruickshank Report in the United Kingdom (UK) and the Wallis Report in Australia). Since then, a need for more studies investigating the role of competition in the economy has come to light. This is due to the crucial role banking plays and serves as central to the economy. Thus, competition is vital to the banking industry. However, while competition is perceived to be vital to the banking industry, it is claimed to have both positive and negative implications on the financial stability of banks. This study will contribute to the existing literature and assist in policy-making by giving the best understanding of the opposing strands in the literature of bank competition and financial stability.

There are material differences in the levels of economic development amongst South African members, which results from the unique levels of financial and monetary development (Aziakpono *et al.*, 2017). Bank competition and stability link affect the allocation of resources (i.e., large banks will concentrate more on the profitable functions and may abandon those that are less profitable), accessibility to choose (for instance, it is particularly bad for investors as it makes investment far riskier), and stability in the economy (Buiter, 2009). This problem affects policymakers that are assigned to launch a stable financial market containing enough degree of competition in the banking industry. Making it complicated to determine the degree of bank competition that is necessary for the country and in this area (Aziakpono *et al.*, 2017), considering various current financial processes affecting competition and stability nexus. Aziakpono *et al.* (2017) Further argued the belief that markets power is needed to some extent to obtain stability makes academics and policymakers concentrate on financial stability instead of bank competition.

Further, the South African banking sector has been categorized as highly concentrated, which may contribute to higher prices, lower outputs, and a smaller consumer surplus even in the absence of collusion. Evidencing from Grietjie Verhoef (2010), who stated that the existence of collusion had been discovered, for which competition commissions were able to eventually prosecutes illegal cartels that were caught in the relevant banking sector (Grietjie Verhoef, 2010). The resulting fear of new banks enters the market encouraged banks to behave in a competitive manner and to improve performance instead of jeopardizing competition. Given the potential losses from a breakdown of the banking system, concentration in the industry can be good in a few critical ways. For instance, assist the regulatory commission to guide few large banks instead of many small ones. Also, systems within each of the large banks will be similar rather than having to learn the systems of many small banks. However, when the banking sector is centralized, there is a high risk that when a shock occurs, this may lead to a collapse of a large portion of the entire financial system (World Bank, 2017). The empirical evidence suggested that the banking system in South Africa is extremely concentrated since it remained at an average of 81.0 percent (World Bank, 2017). Also, World Bank (2017) claimed that the concentration ratio has increased from 94.8 percent in 2000 to 98.9 percent in 2015, which proved the existence of concentration in the industry. These results were supported by a report from the South African Reserve Bank (2010), which appeared that the South African banking sector is characterized by five dominant banks, owning at least or rather controls over 91 percent of total assets of the entire commercial banking sector, which by theory entails concentration. Therefore, given the discussion above, it is essential to evaluate the relationship between bank competition and financial stability in the South African banking sector and the level of concentration existing with effects on financial stability.

1.3 Research Aims and Questions of the Study

1.3.1 Research Aims:

The aim of this study is to investigate the relationship between bank competition and bank financial stability in the South African banking sector. Hence, to achieve this, the following specific objectives have been formulated:

- To identify the level of competition and concentration in the South African banking sector;

- To determine the effect of bank competition on the stability of the South African banking sector;
- To determine the effect of concentration on bank stability in the South African banking sector; and,
- To assess the causality of bank competition and the stability of the South African banking sector.

1.3.2 Research Questions

In addition to fulfilling the aim of this study, the study also sought to answer the following three research questions:

- What is the level of bank competition and the degree of concentration in the South African banking sector?

- What is the effect of bank competition and financial stability in the South African banking sector?

- How does bank concentration affect the financial stability of South African banks?

1.4 The Significance of the Study

Previous research studies on bank competition and financial stability were still not clear, and less agreement has been reached regarding the health and strongness of a relationship existing amongst the variables in question. This topic is of greater concern, pending thorough research by researchers, academics, and policymakers. De-roman *et al.* (2018) noted that bank competition could either increase financial stability (supporting competition stability hypothesis). While in contrast, Boyd and De Nicolo (2005) claimed that bank competition causes financial instability (supporting competition fragility hypothesis). Thus, this study contributes tremendously towards reaching a valuable consensus towards filling the gap and discover whether a vigorous relationship exists between bank competition and financial stability in South Africa, which will be of vital importance amongst researchers, academics, and policymakers when making a decision about the influence of bank competition on financial stability in South Africa. Further researchers, academics, and policymakers will be able to determine the sufficient amount of competition that is mutually beneficial to both clients and financial institutions.

1.5 Methodology Scope

To achieve the objectives of the study, which is to investigate the relationship between bank competition and financial stability in the banking sector using the competition/ stability models are appropriately applied to measure each variable. This study adopted quantitative research approach with a panel data of 5 major banks from 2006 to 2019 secondary gathered yearly data to measure banking sector competitiveness. Specifically, this study utilized the non-structural measures, namely, Panzar Rosse H-statistic (H-stats), the Lerner index, Boone indicator, and concentration[1] , to proxy for competition. H-statistic technique has two successes. First, it requires fewer data to execute. Second, produce robust results, no matter the market structure. However, this tool has a weakness of requirement of long-run equilibrium in its determination of the type of market system. The Lerner index is not a measure of competition in the long-run equilibrium, thus shows short-term dynamics of competition (Carlo *et al.,* 2009). The Boone indicator measure competition on the specific and particular type of banks, which requires fewer datasets to compute and is theoretically robust, as argued by Shaffer (2004). It has the cos of assuming that banks get through their efficiency gains to their clients and ignores the dissimilarities in the product quality (Van leuvensteijn, 2006). Also, the study uses the structural proxied by concentration ratio and Herfindahl-Hirschman Index. Then to measure financial stability, the study uses Z-score and profitability. This method has proven to build accurate indices in many similar studies such as Panzar and Rosse (1977); Berger, Demirgüç-Kunt, Levine, and Haubrich, J. G. (2004); Shaffer and Spierdijk (2013).

1.6 Delimitations of the study

The first limitation is the available of the secondary data for commercial banks operating in South Africa, which is one of the reasons this study limited its scope to the five largest banks that operated from 2006 to 2019. Hence, the chosen sample of the study included five dominant banks which survived during the global financial crisis period or the largest banks, which began their operations at any date prior to 2017. This sample is affected by domination and survivorship bias.

The second limitation is that bank competition indicators are conducted using the time-varying data, which creates time persistent competition measures that are also used in empirical literature to investigate the link between bank competition and financial stability.

[1]

1.7 Structure of Dissertation

This study is organised into five chapters. The first chapter gives the background, problem statement, research aims and question of the study, the significancy of the study, the methodology scope, and the limitations of the study. Furthermore, the scope of methodology employed is outlined, and the limitations faced by the study are noted. Then, chapter 2 discusses the literature review, both theoretical and empirical reviews. First, the theoretical review's general idea is to give a rational explanation of the correlation between bank competition and financial stability. The empirical evidence from other similar studies abroad and narrowed to the South African country setting, which is the focus country for this study. Finally, a summary of the literature findings is presented. They are then followed by chapter 3, which discusses the methodology that is used in this study to reach the measures meant to achieve the research objectives and relevant limitations prohibiting the reaching of the designed objectives. The chapter begins with a description of the study's sample selection process. It proceeds with explaining the statistical tools employed, which helped create the indices and develop the competition stability model. This was followed by chapter 4, which included the regressions, analysis, and detailed discussion of the results. Lastly, the study concludes by giving a summary of theory, empirical evidence presented in the entire study, and the results obtained, conclusions and the implication of the findings, recommendations, limitations and areas of improvement for future studies.

1.8 Chapter Summary and Concluding Remarks

This chapter begins with the background relating to the link between bank competition and financial stability. It gives a thorough argument from the international level and narrows down to the South African setting. The study further elaborates upon competition and financial theories that affecting the banking sector and the continuous debate that exists. The problem statement highlight followed that is the framework for the study and the research questions are alluded to. Subsequently, the significance of the study is conducted, which gives a full discussion on the importance of the study and context specific. The methodology scope and the organization of the study are then presented. It involves increasing the readers' knowledge regarding the design of the empirical models used in the study and how the study is outlined and conducted. The next chapter presents a comprehensive discussion on the competition and financial theories that describe the relationship between bank competition and financial stability and revises both international and local studies regarding this link.

CHAPTER 2: THEORETICAL AND EMPIRICAL LITERATURE REVIEW

2.1 Introduction

Prior to conducting this study, a t thorough review of the literature is compulsory to evaluate the current financial distress and bank competition literature. Additionally, in supplement to enhancing understanding of the topic, the review of previous literature set the foundation of the present research by analysing the key discussions within the scope of financial distress, highlighting the gap in the literature. This chapter gives an in-depth theoretical and empirical review of the studies related to the topic of interest and their findings, with specialization on the link between bank competition, concentration, and financial stability. It further evaluates the theory and background behind all the variables involved and further elaborates on the different hypotheses on the relationship between bank and competition and concentration on bank stability.

This chapter followed the procedure of Bandaranayake's (2018) study, “Essays on bank competition and financial stability,” on how bank competition affects financial stability. Sufficient indicators were employed to suggest if competition does affect financial stability in South Africa. This helps create awareness of the critical indicators of financial stability and improves one’s knowledge of bank competition indicators in general, regardless of their financial status. The intention was to avoid redundancy of what have already been greatly identified on the banking sector evaluation similar to this study but to contribute towards filling a gap that currently exists in the literature, which is how competition and concentration affect bank stability. The objectives of this section were reached through the review of the literature.

The following subsection firstly discusses the competing arguments in the literature of competition, concentration, and financial stability. Secondly, it discusses theoretical foundations of competition, concentration, and financial stability. Thirdly, it discusses the market structure and evaluate the competitiveness and its effect on bank stability in South Africa.

2.2 Theoretical Review

This subsection explores the theoretical foundation of bank competition and financial stability, starting with the examination of the various arguments of bank competition and financial stability. Then, followed by a discussion of the theories of market structure and competitiveness of the banking industry.

2.2.1 The Competing Arguments on Bank Competition and Financial Stability

In the context of high concentration within any economy such as the South African financial industry, Dexu (2016) strongly suggested the use of the franchise value model and concentration-fragility/stability relationship in any study of competition and financial/banking stability, and to an extent, this model will also be used in conjunction with other measures as those used by Zhao (2017) to investigate the link between bank competition on bank financial stability in the South African banking sector. It is also prudent to acknowledge that the relationship between banking sector concentration, competition, and stability that is complex (Carletti and Hartmann, 2003).

There are two major arguments with a vigorous theoretical and empirical referral precedence, which have been prevalent in the studies such as Tabak *et al.* (2002), Yeyati and Micco (2007), and Berger *et al*. (2009), regarding possible bank financial stability changes that may result following an intensifying competition depending on economic conditions, mainly the rate of inflation (Kabir and Worthington, 2015). Koetter *et al*. (2012) also provide supporting evidence to these highly argued theories.

2.2.1.1 Competition Fragility Hypothesis

The first theory is called the competition fragility hypothesis, which highlights the idea of the inverse relationship between competition and financial stability, stating that too much competition results in financial fragility in banks through the erosion of the bank's franchise value (Berger, Klapper, and Turk-Ariss, 2009). This inverse relationship is described by the fact that too much competition within banks affects the market power and profit margins negatively (Martinez-Miera and Repullo, 2010), which lends a bank to making risky decisions (Keeley, 1990; Paligorova and Jimenez, 2012; Zhao, 2017).

The competition fragility hypothesis precedes a study by de-Roman *et al.* (2018) that reviews the bank competition instability (fragility) hypothesis, advising that a huge market power

impact negatively on bank stability. Yet, the magnitude of the effect is low for overall risks on the bank's financial stability; resulting in reduced franchise value (the value of a company's eligibility to continue doing business in the future), known as a portion of its share price, and creating an enhancing the chances for the banks to transact on higher risk engagements (Marcus, 1984; Keeley, 1990). The gist behind this idea is an inverse correlation between a bank's market power and its intangible capital recognized only on the condition of non-insolvency.

2.2.1.2 Competition Stability Hypothesis

The second hypothesis is the competition stability hypothesis. The hypothesis suggests a positive correlation between bank competition and financial stability (Martinez-Miera and Repullo, 2010), claiming that an increase in competition increases financial stability. This hypothesis is well understood through interest rates which decline when a degree of competition intensifies (Martinez-Miera and Repullo, 2010). This makes a bank engage in risky activities (Keeley, 1990; Zhao, 2017), since banks start to issue out many loans through decreased default rates of loans that ensure the stability of banks (Koetter *et al.*, 2012).

The competition hypothesis also suggests that less bank competition causes higher interest rates, as indicated by Rajan (2006); Boivin (2011). However, hiking interest rates can increase the chances of moral hazard problems by rising non-performing loans (Keely, 1990). This hypothesis countered the instability hypothesis by de-roman (2018), that view competition as a resolution to many problems including, information asymmetry and raise inter-bank liquidity, which may improve a bank's financial system. A rise in market power might lead to a bank's increased portfolio risk (Stiglitz and Weiss, 1981). Petersen and Rajan (1994); Boyd and De Nicolo (2005) also support the hypothesis that competition creates stability instead of instability, in line with Petersen and Rajan (1994), who further claims that bank competition is a solution to an optimal contract problem—considering that optimal contract refers to a contract that minimizes cost to the advantage for all parties.

A similar study by Petersen and Rajan (1994) that further investigated the correlation between firms and creditors using the data of United States (US) small businesses. The study found that under the conditions of asymmetric information, it is highly possible to build a long-term relationship with small businesses in need of loans (Petersen and Rajan, 1994). Suggesting that despite the costs associated with the long-term lending (assumed to deter banks from preferring the market power situation) and may be able to deal with a larger business, then charge beyond

the market rate. This possibly enables banks to subsidize the lending to small businesses (Mbambo and Ncube, 2011). Thus, banks assume market power as encouraging both encouraging lendings to small businesses and dealing with mature firms to engage in long-term lending. Although, in the competition stability hypothesis, market power is viewed as detrimental to the state of bank stability (Mbambo and Ncube, 2011).

The absence of competition in the banking sector has many effects, such as more risk of inefficiency due to overpricing by the banks, which may lead to banks earning extra proceeds through price discriminating on deposit and lending rates (Petersen and Rajan, 1994). Then, results in the inappropriate allocation of resources that is harmful to the economy since financial institutions are key plays in the economy (Falken *et al*. 2004). With the presence of all the above-mentioned factors, other viable projects will lack funding or only be financed at higher rates.

Despite the argument of various scholars such as Martinez-Miera and Repullo (2010); Zhao (2017); Keeley (1990), there are many more studies that prove that competition does not merely result in financial fragility or cause banks to engage in risky activities Boyd and De Nicolo (2005); Petersen and Rajan (1994). In general, when competition is introduced in a market that consists of unstable firms, the resulting effect is withdrawal by those firms due to failure, supported in a study by Falken *et al*. (2001). However, with banks the scenario is different. This is supported by studies which were conducted by researchers such as Rubin (1997), who claimed that in ordinary businesses, insolvency highlights a solution that improves a business's health. However, for banks opposite apply. In the case of banks, solvency poses a negative effect on society at large (Falken *et al*., 2001). Resulting from the social costs may be more than private costs, given the bank's business nature and contribution to the entire economy and financial stability (Rubin, 1997). There are also drawbacks aligned with less competition in the banking sector since banks may abuse power and charge higher interest rates (Rubin, 1997). The resulting effect will be a failure of borrowers to adhere to the obligations of repaying borrowed funds (Boyd and De Nicolo, 2005), causing financial instability (Boyd and De Nicolo, 2005). Despite the puzzling correlation between bank competition and solvency, the opposite may apply to market power. For instance, market power can positively link with solvency, as indicated by Caminal and Matutes (2002), which means that competition in the banking sector is not always associated with bank's withdrawal from the sector.

Different scholars such as Boyd and De Nicolo (2005); Allen *et al*. (2008) argued that the risk of loan portfolios is proportionally associated with the rise in market power (Boyd and De Nicolo, 2005). Suggesting that high bank's market power is associated with riskier loan portfolios (Boyd and De Nicolo, 2005). In contrast, Allen *et al.* (2008) showed that more market power (less competition) of a bank has linked to a large level of financial stability. The same scholar further theoretically highlighted that competition leads banks to engage in riskier activities to raise returns (Allen *et al.*, 2008). This is proven in conjunction by the studies by Allen *et al.* (2011); Boyd and De Nicolo (2005), where unique approaches were applied towards approaching the drivers of competition and the resulting effect caused by a change in the degree of bank competition to financial stability. Even though the findings were that competition may be detrimental, primarily to bank's portfolio risk, the same conclusions that competition increases total bank stability were reached (Allen *et al.*, 2011).

2.2.2 Market Structure and Competitiveness of the Banking Industry

This subsection explores the theoretical foundation of Market Structure and Competitiveness of the Banking Industry, starting with examining the various theories of competition, including Innovation and Bank Competition, Innovation Theory. The Schumpeterian Hypothesis, followed by a discussion of the ideas of the relationship between competition and competition, then discusses the measures of competition (including both structural and non-structural measures).

2.2.2.1 Innovation and Bank Competition

Competition is the most essential factor that is relevant to all innovation, profitability, concentration, and financial stability (Carletti, 2008). Bank competition mostly influences a bank's functional behaviours, then materially impact bank financial stability and profitability (Carletti, 2008). For instance, a bank's innovation activities enhance the efficiency of screening and observing borrowers, which is essential for risk-taking adjustment and profitability. According to Park (1998), bank competition exists as the survival of the fittest dynamic process of rivalry within banks. Prices are considered to flexibly vary between forces of demand and supply (Berger, Klapper, and Turk-Ariss, 2009).

Innovation in the banking sector is considered by researchers such as Carletti (2008) as the most vital factor which impact profitability, competition, concentration, and financial stability since bank's innovation activities enhance the efficiency of screening and observing of borrowers, which leads to risk-taking elimination and profitability (Allen *et al*., 2011). Mostly,

financial innovation creates technology-based products which have numerous benefits, including less risk and large returns, therefore enhance financial stability (Carletti, 2008).

2.2.2.2 Innovation Theory

Innovation theory was introduced to gain an understanding of the change that was an exception to financial stability and equilibrium (Allen *et al*., 2011). However, if society is constantly moving and everything is changing, many authors, including Allen *et al*. (2011); Cihak and Schaek (2007), claimed change is not an exception instead of a norm.

Innovation through technology improvements further contributes towards enhanced efficiency of the screening and monitoring of borrowers (Chen, 2007). Hence, this eliminates the volume of nonperforming loans and properly guides the credit risk-taking, as supported in the study by Cihak and Schaek (2007), who argued the high level of efficiency as a safe haven for the banks since it offers fewer chances of bank default and improved financial stability. At the same time, some scholars argued in the opposite when it comes to risk elimination resulting from financial stability. For instance, Norden *et al*. (2014) claimed that the effectiveness of innovation in the banking sector depends on how and what the banks use it for. In the case where innovation is adopted as a strategy for obtaining more turnover, that will result in an enhanced degree of risk-taking and results in instability associated with bank failure (Norden *et al*., 2014). On the other hand, innovation achieves financial stability when utilized for risk control, such as monitoring borrowers and screening (Norden *et al*., 2014). Hou *et al*. (2014) investigated Chinese commercial banks to determine the correlation between risk-taking actions and technical efficiency, and findings suggested a positive correlation between the two hypotheses of competition.

2.2.2.3 The Schumpeterian Hypothesis

The other theory that is relevant in the discussion of bank competition and innovation relationship is the Schumpeterian hypothesis (Carletti, 2008). The Schumpeter hypothesis states that the correlation between innovation and competition is the key aim of the industrial organization theory (Schumpeter, 1912)[2]. It starts by portraying bank competition as depressing innovation through the elimination of monopoly rents and further claims that huge banks can possibly mandate more capital for innovation activities (Smirlock, 1985). On the other hand, other academics and researchers oppose the hypothesis of Schumpeter and suggest

[2] The Schumpeter Theory (1912) was the first to outline contribution of financial stability improvement on economic growth.

that there are more benefits under perfect competition than in a monopoly (Schumpeter, 1912). Scholars claim that a perfectly competitive market is giving an opportunity for expanding innovation activities and allow banks to facilitate dodgy behavior amongst themselves through evading competition then earn monopoly rents (Schumpeter, 1912).

This Schumpeter hypothesis further claims technological innovation as one of the key sources of growth and welfare (Schumpeter, 1912). Then precisely indicate that the type of competition has more relevance towards innovation (Smirlock, 1985). For instance, Schumpeter suggested that bank competition hardly results in innovation as long as there are weak property rights. Thus, imperfect competition may be preferred in that manner (Aghion *et al*., 2005). The ability of banks to innovate will enable them to capture the market and take other banks out of business (Norden *et al*., 2014). The Schumpeterian competition is more related to financial instability (Schumpeter, 1912). Aghion *et al*. (2005) developed a theoretical model that produced the results, which confirms that two effects fluctuate with the level of competition in the banking sector and yield inverse outcomes. Therefore, the net effect of bank competition on innovation is unambiguous.

2.2.3 Relationship between Banking Concentration and Competition

The structural and non-structural approaches to measuring competition are the two key approaches found in the literature (Cowling Keith and Waterson Michael, 1976). The Structure-Conduct-Performance (SCP) model by Barney and Clark (2007), the efficiency hypothesis by Downey, and a variety of systematic methods originating in Industrial Organization (IO) theory are all part of the systemic approach to model competition (Smirlock, 1985; Evanoff and Fortier, 1988). The SCP theory refers to the analyses of whether a high market concentration leads to collusion between dominant banks, causing higher market performance (Kaufman, 1966). On the other hand, the efficiency theory examines whether big banks' efficiency leads to improved performance (Kaufman, 1966).

The writing on the estimation of competition may be apportioned into two mainstreams, namely the structural and the non-structural approach (Kaufman, 2020). The structural approach to demonstrate competition incorporates the Structure-Conduct-Performance (SCP) worldview and the effectiveness speculation, as well as several formal approaches with roots in the Mechanical Organization hypothesis (Kaufman, 2020). The SCP model explores whether the most concentrated market results in the act of collusion among dominant banks causing predominant market execution, while the efficiency theory tests whether it is the productivity

of bigger banks that produces for upgraded execution (McGuire, 2000). The response to hypothetical and observational failures of the auxiliary or rather structural models and non-structural models of competitive behavior have been developed, such as the Iwata paradigm, the Bresnahan paradigm, and the Panzar and Rosse paradigm (China, Jefferson, and Xu, 1991). These Unused Observational Mechanical Organization approaches degree competition and stresses the investigation of banks' competitive conduct without utilizing unequivocal data almost advertise structure (Evanoff and Fortier, 1988).

When acknowledging the hypothetical recommendation that a more concentrated market infers a lower level of competition resulting from the uninvited implementation of market control by banks (Phillips 1971; Dasgupta and Stiglitz 1980), alternative hypotheses (i.e., contestability hypothesis) holds that, under certain conditions, competition, and concentration can exist simultaneously (Phillips 1971; Dasgupta and Stiglitz, 1980).

To examine the degree of competitive level in any given sector, a thorough examination of the market structure is fundamental (Smirlock, 1985). Whereas profoundly concentrated markets do not essentially infer the need for competitive conduct, it is by, and large concurred that market concentration is one of the foremost critical determinants of competitiveness (Nathan and Neavel, 1989). The banking sector correlation between market concentration and competition has been inspected in detail for numerous nations, and the outcomes demonstrated that the highly concentrated banking sector tends to diminish competitiveness in this division (Gilbert, 1984).

2.2.3.1 Contestability Theory

When discussing the theory of concentration, it is of vital importance to touch on the contestability theory. With the modern wave of mergers within the banking sector and the desire to proceed or quickening solidification, concerns have been stated as to competitive conditions within the managing an account markets, particularly in a few showcase fragments, such as neighbourhood and retail markets (Boyd and De Nicolo, 2005). More accurately, the address develops whether showcase concentration might influence the conduct of banks or the degree of competition (Sherpherd, 1984). Hypothetically, the presence of a relationship between advertises structure and banks' behaviour is indicated by, among others, the Panzar-Rosse demonstration (Boyd and De Nicolo, 2005). Where, within the writing, the effect of the keeping money showcase structure on bank execution has been inspected thoroughly, utilizing the Structure-Conduct e execution (SCP) worldview, the significance of market structure for

conduct or competitive conditions have been nearly completely disregarded (Schumpeter, 1912).

This sub-section unpacks the neglected relationship of banks and tries to understand the impact caused by the number of banks, as well as concentration on competition in the banking sector. Although, when describing the market structure, the concept of the number of banks is insufficient.

2.2.3.2 Measurement of Bank Competition

Bank competition evaluates the market power the bank/s has within its sector of existence (Tunay and Yüksel, 2017). The recent school of thought that investigated bank competition stated that measures could be utilized to evaluate the degree of market power the banks possess (Arun and Turner, 2004; Caprio and Levine, 2002; Levine, 2004). A review of the literature demonstrated an increase in the extreme need for the use of the measurements of bank competition, including Concentration, Lerner index, Boone indicator, and H-statistic (Abedifar *et al*., 2014).

The previous studies by Milbourn *et al.* (1999); Weill (2013) used the bank sizes, bank concentration, and the number of banks as part of determining factors in the banking sector. However, technological advancements affect the strategic position of banks in the market. As a result, this brings about a debate amongst academics and researchers in relation to the potential determinants of bank competition (Kabir and Worthington, 2015). Given the existing arguments by academics such as Kabir and Worthington (2015) relating to the determinants of bank competition, arises a threat about new banks joining the banking market and make a huge impact (Levine, 2004).

A study by Matutes and Vives (1996) found bank competition to negatively impact the deposits, resulting from inflated deposit rates, consequently leading to a decrease in the bank's profit margin, which increases the bank's stability. This was further validated by a study by Marquez (2002), who found that market power reduces a bank's profitability potential due to the risks taken. These findings were further justified through a study by Kabir and Worthington (2015), who claimed that too much competition in the banking sector is the cause of inefficiencies and favour banks with information over the compact banks.

Empirical evidence from various studies, including but not limited to the study by Bhatti and Hussain (2010), which assessed competition in the banking industry of Pakistan, obtained the

results that are in support of the SCP hypothesis. On the other hand, Suzuki and Uddin (2014) investigated and found the negative correlation link between bank competition and profitability, using data of Bangladesh banking sector. Kamau (2013) tested the dynamic aspects of bank performance in Kenya in the period between 1997 and 2011. Found that the structure or collusive power is the key to the superior performance of the bank. Tan and Floros (2014) tested for correlation between profitability, risk-taking, and market competition within the Chinese banking sector for the period 2003 to 2009, and the results confirmed the existence of an inverse relationship between competition and profitability.

Several benefits come through competition into the banking sector since the absence of competition in the banking sector, poor credit provision, considering the role of competition in serving as a bridge amongst competition and clients (Claessens and Laeven, 2005). Bikker, in the study conducted in 2010, emphasized the significance of competition in the banking sector since this was viewed to enhance financial progress and easy access to basic financial services by developing business. Bank competition further improves the welfare of the economy and contributes significantly to the economy (Bikker, 2010). Hence, bank competition has a positive relationship with productive efficiency. Schure and Wagenvoort (1999) claimed that banks in Italy reached a productive efficiency and a high level of financial stability after 2003, which was a period recognized as highly competitive by Angelini and Cetorelli (2002).

Despite the incentives presented by bank competition, there are many factors that hinder bank competition (Angelini and Cetorelli, 2002). Given the nature of the banking business and the banking sector, Bikker and Spierdijk (2009) suggested that there are large barriers to enter the supply side of the banking sector in developing economies. In contrast, Bikker and Spierdijk (2009) also highlighted that bank competition could be adjusted by the type of financial services due to substitutes. For instance, the nature of contractual services rendered by banks, such as home loans, makes it hard for customers to switch within banks (Angelini and Cetorelli, 2002).

Table 2.1 Summary of Structural and Non-structural Measures of Bank Competition

Method	Advantages	Drawbacks
Structural Approach:		
Concentration measures (CR, HHI)	Requires less data.	Lacks a strong theoretical foundation.
	Applies without firm-level variables	Needs proper relevant market definition (geographic, products).
Non-Structural or New Empirical Organisational Approach:		
Boone Indicator	Has strong theoretical background.	Requires observed and one-dimensional efficiency.
	Possible to measure using a simple linear model.	Fails to separate between different types of competition.
	Only a few observations are necessary.	Applies firm-level variables as well as information on prices.
	Measure's competition continuously.	There are issues with identification sometimes. For instance, when firms compete equally.
	Its functionality mostly depends on price strategies.	
Lerner Index	It can be used malleably.	Can be influenced by spending on different activity and inefficiency.
	Uses few numbers of observations.	Use firm-level variables as well as the information on prices.
	Easy interpretation.	Lack stability in theoretical foundations (i.e., Competition does not equal market power).
	Bank-specific measure.	
Panzar Rosse (H-statistics)	Possible to measure using a simple linear model.	Uses price information and monopoly power could be disadvantaged by monopsony power.
	Use the limited number of observations.	Not easily identifiable and requires verification of the most important assumptions.
	Its robustness relies on the market.	

Sources: Mason (1937) and Bain (1956)

Table 2.1 above gives a brief summary of structural and non-structural measures of bank competition. The table 2.1 segregates the measures of bank competition into three subcategories namely, method, advantages, and drawbacks. Further discussion on the measures is provided below starting form the next subsection.

2.2.4 Structural Approach Measures

The Herfindahl-Hirschman Index (HHI) and Concentration Ratios (CR) which are the measures of concentration, tells us about market structure and whether few large firms

dominate the market or not (Hicks, 2009). The study of Keeley, (1990) reviews and expands on the use of the Lerner Index, Boone indicator, and H-statistics as non-structural measures of bank competition that were also used by Anzoategui, Peria, and Rocha (2020) in their study that investigated bank competition abroad (Middle East). Current literature suggests that concentration depletes the power of bank competition as it motivates banks to collude (Evan and Fortier, 2010). Thus, collusion by few dominant banks results in higher prices being charged and extraordinary profits being obtained (Bain, 2012). However, studies by Smirlock (2008); Evan and Fortier (2010) viewed concentration as the reason for productive efficiency. This demonstrates the link between efficiency and market structure corresponding to the white life hypothesis by Hicks (2009). Hicks (2009) claimed that monopoly power is detrimental to efficiency by allowing bank managers to endure a quiet life free from the competition, which causes eliminated efficiency (Evan and Fortier, 2010).

On the other hand, Liebenstein (2005) argued that competition is essential towards reducing inefficiencies since it allows bank managers some time to deal with challenges. Given that a large banking sector concentration reduces the degree of competition, indicating an inverse correlation of bank competition and efficiency, demonstrating causality running efficiency of competition in the SCP pattern, as highlighted in the efficiency hypothesis (Goddard, Molyneux and Wilson, 2001).

Observations concerning empirical research studies suggest that the effect of market structure on banks' conduct is not common. This kind of relationship is assessed using variables such as the H-values demonstrating competition as the intermediaries of structure conduct linked to concentration lists and numbers that are involved in market structure (Yildirim and Philippatos, 2007). On the other hand, when using the k-bank concentration indices, the effect of both market structures on competition is material. This is in support of the literature stating that few large banks limit the degree of competition and threatens the new competitors. Empirical studies including Casu and Girardone (2006), who investigated banking markets for 15 European Union countries for the period between 19997-2003, their findings showed no relation between competition and concentration, in support to findings of Claessens and Laeven (2004), which investigated 50 countries using H-statistics. In contrast, a study by Yildirim and Philippatos (2007) investigated the relationship between concentration and competition using the H-statistic for eleven Latin American countries from 1993-2000 and found no relation empirical evidence supporting the hypothesis that free trade invites an increased level of competition.

When analysing the competitiveness of any sector, a thorough analysis market structure analysis is the key (Nathan and Neavel, 1989). Despite the idea that highly concentrated markets do not necessarily imply a lack of competitive behaviour, it is generally agreed that market concentration is one of the most important determinants of competitiveness (Nathan and Neavel, 1989), on top of the other three indicators. Hence, this subsection expands on two topics of structural and non-structural approaches. The traditional industrial organization theory is more on the structure-conduct-performance (SCP) paradigm and efficiency (Tushaj, 2010).

The SCP approach may have drawbacks affecting its efficiency due to various reasons, including but not limited to accounting data on profits may not provide an accurate measure of economic gains and market power (Berger and Hannan, 1998). The second substantial concern is an opposing hypothesis, estimating the exact positive correlation between concentration and profits (Berger, 1995). Using the efficient structure (ES) hypothesis, banks that have sizeable productive efficiency face lower costs hence results in higher profits. Further, these banks perform better, thus, automatically earn market share, causing concentration (Berger, 1995; Berger, Demsetz, and Strahan, 1999; Punt and Van Rooij, 2001), which means that concentration presents highly efficient banks, other than the actual rise in market power.

This sub-section discusses various competitive conduct of South African banks as well as the characteristics that have the potential to influence such behaviour. The competition variable measures are segregated into structural and non-structural measures (Tushaj, 2010).

2.2.4.1 Bank Concentration

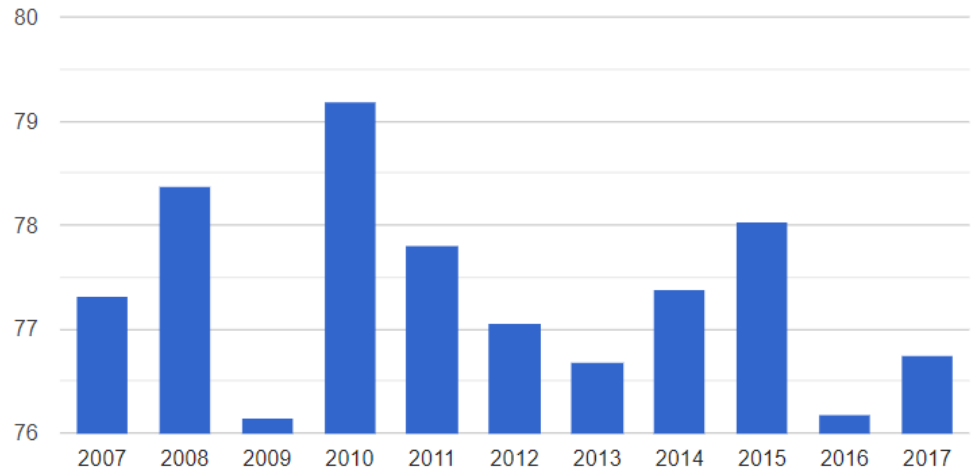
In the financial market, concentration is loosely defined as the level of control by a few larger firms, according to the market share (International Monetary Fund (IMF) and World Bank, 2005). Thus, the analysis of the effect of competition on financial stability in the banking sector needs an expansion to consider concentration which refers to the degree of control (domination) of economic activity by large firms (Sathye, 2002). Concentration as an important structural proxy for competition refers to the degree of regulation of economic activity by large firms (Church and Ware, 2000; Sathye, 2002). In the scope of this study, concentration refers to the denomination in the banking sector of South Africa by few large banks such as ABSA, Standard Bank, FNB, Nedbank, and Capitec (Nicoló *et al*., 2006), measured by concentration ratios (CR) and Herfindahl-Hirschman Index (Beck *et al*., 2009).

The more concentration in the banking sector, the more probability of banks engaging in high-risk activities is high due to the view that these banks are too big to collapse (Berger, 1995 and Beck *et al*., 2009). Thus, less prone to failure considering that government will intervene when they encounter insolvency (Berger, 1995; Beck *et al*., 2009). To this study author's belief is the latest study to investigate the correlation between bank competition and financial stability within the scope of South African banking sectors.

The traditional strategy to measure concentration was mainly of the idea that more banks are accompanied by more price competition, whilst on the other hand associate a smaller number of banks with less competitive behaviour (Church and Ware, 2000). This, according to Northcott (2004), prevails a classic IO argument termed structure-conduct performance (SCP) paradigm, which is of the idea that the causal correlation pattern starting from market structure (for instance, concentration) to banks pricing behaviour, up to the bank's profits and level of market power (Shaffer, 2002). Typically, Weiss (1989) states that more firms cause banks to price competitively, eliminating the level of market power for each bank in the industry may exercise.

The early literature provided by Berger (1995); Berger, Demsetz, and Strahan (1999) suggests that concentration can be measured (alternative to the SCP paradigm) using the ES hypotheses through the use of X-efficiency, and these findings were further supported in a similar study by Punt and Van Rooij (2001). According to the literature by Okeahalam (2002); Beck, Demirgüç-Kunt, and Levine (2003). and the Organisation for Economic Cooperation and Development (OECD) (2010), the nature of the South African banking sector is by theory highly concentrated at a ratio of C5, suggesting the degree of competition would be low. The International Monetary Fund (IMF) estimated the degree of bank concentration in South Africa was 77 percent in 2011, while the OECD (2010) had found that the commercial and retail banking industries in South Africa have been highly concentrated since the early 1990s. However, research has indicated that concentration does not materially purport the nonexistence of competition (Simatele, 2015). The reason behind this logic is the scenario of a contestable market and the classic Bartend equilibrium (Claessens and Laeven, 2005).

Figure 2.2 The South African banking system concentration over years



Source: The Global Economy, Bankscope (2020)

The average value of concentration for South Africa during the 2010 period was approximately 79.25 percent, and the latest value from 2017 is 76.75 percent (Global Economy, 2020). For comparison, the world average in 2017 based on 159 countries was 65.54 percent (Global Economy, 2020).

Empirical findings associating concentration and profits are incomplete and unsatisfactory, including the study by Simatele (2015), noted that other researchers such as Okeahalam (2001), Mlambo and Ncube (2011); Simbanegavi, Greenberg, and Gwatidzo (2014), which empirically investigated the concept of concentration in the banking industry and identified it as a major issue to authorities. These empirical findings are backed by numerous cross-country studies such as those by Claessens and Laeven (2005); Bikker and Spierdijk (2008); Bikker, Steenbeek, and Torracchi (2012).

Marfels (1971); Dickson (1981) noted that various indicators of concentration for k-banks (k-CR) including but not limited to concentration ratios, Herfindahl-Hirschman Index (HHI), The Hall-Tideman Index (HTI), the Rosenbluth Index (RI), the Complete Industrial Concentration Index (CCI), the Hannah and Kay Index (HKI), the U Index (U), the Multiplicative Haus Index (Hm), the Hausa Addictive Index (ha) and the Entropy Calculation Index (E) (Bikker and Haaf, 2001). However, this research study only extended discussion and the rationale behind concentration ratios and HHI (Bikker and Haaf, 2002).

The theory of concentration by Keely (1990) was used to enlighten bank competitiveness theory. The theory claims that less concentration is the key contributor to financial crises (Keely, 1990). The concept of franchise value by Martynova *et al.* (2014) is towards

understanding this phenomenon (Keely, 1990). The franchise value maintains the activities of the banks through the elimination of the number of risks a bank engages in (Martynova *et al.*, 2014). A higher percentage of risk the bank has, suggests more chances of insolvency (Claessens and Laeven, 2005). This is supported by the competition fragility theory, which states that excess competition eliminates the franchise value of banks, which leads banks to participate in more risky activities (Claessens and Laeven, 2005).

The mainly used measure in the literature on market concentration is typically concentration index (using s-Bank concentration ratios and combining such shares of few large firms) and HHI since it was used by the researchers such as Bikker and Haaf (2002); Cetorelli (2004); Casu and Girardone (2006). There is no regulation that applies when selecting the appropriate value of s (Casu and Girardone, 2006). Hence, the inclusion of banks in the concentration index is solely a matter of the researcher's discretion. The index can range from zero (0) to infinite units for banks of the same size. Therefore, all banks are used in the computation of concentration ratio (CR) (Bikker and Haaf, 2002).

Most of the research on concentration within the banking sector assessed the impact concentration has on the financial steadiness, proficiency, and competitiveness of the banking sector. Confirmed by D'Arista (2009) who observed from the study conducted on the top ten banks of the United States who owned 26 percent of the banking sector's total assets in 1984 and found that concentration worsens the financial stability in the banking sector. However, the opposite was found in 2008 by D'Arista (2009), using five banks that accounted for 97 percent of the total assets.

Law and Abdullah (2006) assessed the impact of bank concentration on monetary improvement through employing a cross-country investigation of 68 countries and found that bank concentration and financial development are positively related in lower- and middle-income countries. In contrast, DemirgüçKunt and Levine (2005) findings are in support of the competition stability hypothesis. On the other hand, Fiordelisi and Cipollini (2009) assessed the 25 European Union commercial banks of observed a positive link between bank concentration financial instability. In support, Bikker and Groeneveld (1998) emphasised the conventional view that concentration impairs competitiveness as well as possible abuse of market power.

i. Advantages of Bank Concentration

Concentration advantages in the banking sector claim that economies of scale determine bank mergers and acquisitions, hence, results in an increased level of concentration (Demirgüç -Kunt and Levine, 2000). This has been found a good alignment of concentration with efficiency developments (Demirgüç -Kunt and Levine, 2000). Other theoretical views and depending on the country of setting, claims that concentration by few small banks more probable to results in financial problems as compared to a sector concentrated by few large banks (Berger, 1995). Since a reduced level of concentration in the banking sector boosts the level of competition, this is in favour of the concentration fragility hypothesis (Berger, 1995).

ii. Disadvantages of Bank Concentration

Concentration is linked to various evidence, including findings presented by Berg *et al.* (1995), which describes bank concentration as the main contributor to a decrease in credit supply. Since concentrated financial markets have a few large suppliers, as suggested by Cetorelli, Hirtle, Morgan, Peristiani, and Santos (2007). Berger *et al.* (1995) also argues further and claims that a high degree of concentration in the domestic market contributes to inflated prices of financial services, results in large bank turnover. This has been further argued to result from higher prices charged by banks in a less concentrated market. Beck, Demirgüç-Kunt, and Levine (2004) claimed that a positive correlation between concentration and market power suggests the potential to simultaneously increase the desired rate of return on assets of a bank and the standard deviation of the relevant return. The policy implication correlates concentration with weak socio-economic welfare. Hence, consider higher concentration as inefficient (Tushaj, 2010). Since a higher level of concentration in the banking system increases the chances for bank fragility (referred to as concentration fragility).

Also, Beck, Demirgüç -Kunt, and Levine (2004) noted that in a financial banking system concentrated by few large banks, effective control is easily implemented and eliminated consequences of contagion. Boyd and Runkle (1993) stated that concentration-fragility is against the hypothesis that large few banks are easily manageable and further claimed that these banks receive exclusive benefits such as frequent subsidies without consideration of the small banks, resulting from too big to fail policies (Tushaj, 2010). Thus, it indicates a positive relationship between concentration and fragility. The findings entail that monopolist power is a disadvantage since it results in inflated opportunity costs (Smith, 1998). Hence, low levels of competition in the market may consequently impact economic development.

2.2.4.1.1 Bank Concentration Ratios

In this study, the concentration level is measured by two indicators, namely concentration ratios and Herfindahl-Hischiman Index (HHI). However, this subsection reviews the theory for concentration ratios (CR). The Concentration ratios were used a long time ago in the study of industrial organisation to gain an understanding of competition in a market (Church and Ware, 2000). In the banking system, the concentration ratio measures the market domination by either the top three (3), four (4), or top five (45) banks (IMF 2004). The CR represents the total market shares covered by the few largest N firms (banks in the case of this study) (Church and Ware, 2000). It is possible to compute the CR by adding the value of sales for the dominant banks and then divide it by overall market shares (Church and Ware, 2000). These ratios have been known ever since the early studies by Mason (1930s) and later revised by researchers such as Bain, which highlighted that there is a positive relationship between concentration levels, prices, and profits in the banking market (Econex, 2015). However, new research studies, including that of Mlambo and Ncube (2011); Simbanegavi, Greenberg, and Gwatidzo (2014), prove that the existing relationship is more complex than outed to be by the previous studies. Further, the causation has a possibility that larger turnover results in a high degree of concentration (Econex, 2015).

i. Advantages of Concentration Ratios

One of the most appealing features of the concentration ratios is their simplicity in creation and interpretation (Econex, 2015). High concentration levels will increase profits for the dominant banks within the industry as proposed by Ben-Zekry (2007). While this may lead to higher interest rates and fees it will also insulate banks from economic shocks (Mathisen and Buchs, 2005).

ii. **Disadvantages of Concentration Ratios**

There are many drawbacks regarding the use of concentration ratios to the extent that it only looks at market structure, which is only one prospect of competition. Thus, this statement does not quantify market power directly (Econex, 2015). Furthermore, the concentration ratios mostly depend on the Structure-Conduct-Performance hypothesis (Econex, 2015). Another drawback of the CR is the advantage of aiming at few dominant banks instead of the entire industry (Econex, 2015).

2.2.4.1.2 Herfindahl-Hirschman Index (HHI) approach

The Herfindahl-Hirschman Index (HHI) is defined as the percentage size of a few firms of interest in relation to the industry and is an indicator of the level of competition within the market (Herfindahl, 1950). Adelman (1969) used a modified version of the HHI to measure the degree of concentration, found that the existing relation is not simple due to the number and size of banks that can produce the same HHI. Also, Davies (1979) analysed the sensitivity of HHI into two compound parts. First is the number of banks in the market and the inequality in market shares among the different banks and found that the index becomes less sensitive to changes in the number of banks in the industry. In contrast, Rhodes (1995) claimed that the inequality of market shares to banks could change according to the market and without changing the value of HHI.

According to Simatele, Mishi, and Ngonyama (2018), the National Treasury (2011) claimed that the South African government commissioned on the nature of competition using index measures including HHI, the feedback provided through the report resolved that South Africa is largely concentrated. When studying the nature of concentration, only a few studies, including but not limited to, Okeahalam (2001, 2002 and 2004); Beck, Demirgüç-Kunt and Levine (2003); Ben-Zekry (2007) have explicitly considered the HHI as a measure of concentration.

The market power can be reliably measured using accounting data on profits and costs (Northcott, 2004). While traditional studies using this approach are based on cross-industry data, a wide literature applies the paradigm to one certain industry over time. The theory suggests a positive link between HHI as a measure of concentration and profits, thus an increase in a bank's financial stability (Kwok, 1985). Falkena Davel, Hawkins, Llewellyn, Luus, Masilela, Parr, Pienaar, and Shaw (2004), who used the Herfindahl-Hirschman Index (HHI) to determine the concentration in the banking sector in South Africa, found the existence of high levels of concentration.

i. Advantages of the HHI approach

The key advantage of the HHI is its flexibility and ease in computation which requires less data (Pienaar and Shaw, 2004). The HHI shows the division of overall market shares and assigns weight to the largest banks. Hence it is for the reasons above that the HHI is regarded as the best compared to concentration ratio. (Pienaar and Shaw, 2004). Also, the HHI does not account for nuances, such as the fact that while there might be several banks active in an

industry, suggesting healthy competition, one company might control the majority of the business for the sale of one specific product, which suggests a potential monopoly.

ii. Disadvantages of the HHI Approach

The key drawback of the Herfindahl-Hirschman Index (HHI) results from the reality of simplicity's inability to compute complex assessment of different market conditions such as competitive or monopolistic (Pienaar and Shaw, 2004). For instance, a case of measuring the industry of 10 active banks, where every bank owns approximately 10 percent market share. The HHI would present the industry as more competitive than any other concentration ratio (CR).

2.2.5 Non-Structural Measures/ New Empirical Industrial-Organizational Approach

Authors such as Nathan and Neave (1989); Shaffer (1993); Bikker and Groeneveld (1998); Bresnahan (2012), who have studied the non-structural approaches, postulate those factors other than market structure and concentration may have an impact on competition and performance, factors which includes barriers to entry/exit and the ordinary contestability of the market.

Firstly, non-structural approach measures used in practical studies gauge the banking sector competition, which makes it a more desired approach amongst authors such as Gischer and Stiele (2008); Carbó *et al.* (2009) since it cannot be assumed that concentrated markets are not competitive due to the independence of contestability from market structure, rather depends on potential competition (Gorddard *et al*., 2001). Lastly, non-structural measures mostly depend on measures of Monopoly power (Lerner, 2012). Additionally, non-structural measures cover indicators of bank competition and concentration amongst those that were already used to assess market conditions in contestable markets and oligopolists (Panzar and Rosse, 1987).

The non-structural measures of competition include the models of Iwata (1934); Brenshnahan (1982); Panzar Rose (1987); Lerner (1934). Although the study uses the three models, namely, Lerner (1934), Boone (2008), and the Panzar Rose (1987), in the discussion when evaluating the level of competition. The next subsection starts by the discussion of the Lerner index approach, follows by the Boone Indicator, then lastly, the Panzar-Rosse H-statistics.

2.2.5.1 The Lerner Index approach

The Lerner index compares a firm's output price with its related marginal costs, in the case where marginal cost pricing is referred to as the 'social optimum that is reached in perfect competition' (Lerner, 1934). It has been employed by various studies such as Guevara *et al.* (2005) ; Berger *et al.* (2009); Carbo *et al.* (2009); Anzoategui *et al*. (2010); Coccorese and Pellecchia (2010); Anzoategui *et al*. (2012); Delis (2012); Love and Martinez-Peria (2012) and Beck *et al*. (2013) who found controversial results particularly the magnitude of the index which relies on the source of data, on the structuring of variables and estimation technique, and branched amongst popular New Empirical Industrial organization (NEIO) literature (Iwata, 1974; Appelbaum, 1979, 1982; Roberts, 1984).

The Lerner index in the banking sector recognises the price charged by a bank in its market diverges from the price that would emerge in case of perfect competition (Lerner, 1934). This explains why it is calculated as the difference between the actual price and marginal cost, divided by price. Generally, the Lerner index assumes convergence to zero as the competition expands while increasing as the market power rises (up to 1, as per theoretical provisions) (Lerner, 1934). In the banking sector, the Lerner index determines the mark-up charged by banks to clients through working out the between loan interest rates and marginal costs, then articulating it as a proportion of the former (Lerner, 1934). Hence, the Lerner index is regarded as a direct measure of competition.

Shaffer (2004) found that Lerner Index is closely associated with other NEIO measures of competition *viz* the model of Iwata (1934), Brenshnahan (1982), Panzar Rose (1987), which are formally obtained from deriving the profit-maximisation equilibrium conditions (Coccorese, 2014). Supported by Beck *et al.* (2013) proved that Lerner indices and positively and statistically linked to other competition measures. In contrast, Delis (2012) claimed that there is a strong link between the Lerner index and the Boone indicator for the banking industries of several countries, concluding that the Lerner index is an important indicator of market power (Coccorese, 2014).

i. Advantages of Lerner Index approach

The main advantages of the Lerner index are its simplicity, its straightforward interpretation, and the fact that it does not have stringent data requirements (Turk-Ariss, 2010). Another

proponent of the Lerner index is the capability to be measured both at the bank level and during the time, so it can identify different patterns of behavior within the same market and/or between years (Coccorese, 2014). The Lerner index is also a flexible indicator and does not require defining the relevant market (Turk-Ariss, 2010). Lastly, the Lerner index can be measured with a restricted quantity of variables using average cost to proxy for marginal costs (Turk-Ariss, 2010).

ii. Disadvantages of Lerner Index approach

One of the major drawbacks of the Learner Index, as indicated by Vives (2008), is that the Lerner index inappropriately captures the degree of product substitutability. On the other hand, de Guevara *et al.* (2005) stresses that, when a bank's risk-taking is not accounted for, the Lerner index could exaggerate the market power since the banks that in relative terms spend more of their resources through granting credits enjoy higher margin. Also, as Beck *et al.* (2013) note, the Lerner Index lacks a strong definition of the geographical market of the bank or, worse to market share or market concentration measures.

2.2.5.2 The Boone Indicator Model

Demsely (1973), suggested that the Boone indicator measures the effect of efficiency on performance according to profit or market shares. The Boone indicator also evaluates shares in a similar way that the efficient structure does, as theoretically suggested by Demsely (1973). The theory of the Boone indicator suggests that efficient firms gain through competition whilst those that are vulnerable (inefficient firms) performance worsens, judging from corresponding market shares or turnover (Boone *et al.*, 2004). This approach is like the famous efficiency hypothesis, which describes a bank's performances by dissimilarities in efficiency (Goldberg and Rai, 1996; Smirlock, 1985). The measure is more about differences in performance than the structure caused by efficiency to evaluate the competition. Boone developed more sets of theoretical models (Boone, 2000, 2001, and 2004; Boone *et al.*, 2004; CPB, 2000).

i. **Advantages of Boone Indicator approach**

The Boone indicator has various strengths, including the ability to measure the level of competition as a bank's capability to transform their price-cost margin efficiency in terms of higher market shares (Boone *et al.*, 2004). The ability to indicate evolution over a period instead of static over time (Boone *et al.*, 2004). Ability to accommodate a given market at a sectoral

level (Boone *et al.*, 2004). Also, it has a solid theoretical framework when it comes to indicating competition. Hence, it is robust in determining the degree of competition in the presence of high competition and eliminated barriers to enter the market. Lastly, the Boone indicator uses data that is similar to other measures that use the PCM approach, such as the Lerner index and H-statistics. For instance, Schaek and Cihak (2014) proved that the Boone indicator contains at least 80 percent of the information used in other variables, including but not limited to government ownership, H-statistic, and the Financial Freedom index. Furthermore, it requires less data as compared to other measures—for example, the Bresnahan model, which uses a large amount of data.

ii. **Disadvantages of Boone Indicator approach**

Since the Boone indicator shares some characteristics with other PCM approach competition measures, it has the disadvantage of being an estimate and thus is surrounded by a degree of uncertainty (Boone *et al.*, 2004). Another disadvantage of the Boone indicator is the fact that it assumes that banks normally give some of the efficiency gains to the clients (de Guevara *et al.*, 2005). Furthermore, like many other model-based measures, our approach ignores differences in product quality and design across banks, including the attractiveness of innovations.

2.2.5.3 The Panzar-Rosse (H-statistics) model

On the non-structural hypothesis side, the most well-known models are developed by Iwata (1974); Bresnahan (1982); Panzar and Rosse (1987). In Panzar and Rosse (1987) model, the H-statistic is a quantitative measure for gauging the level of competition in the banking sector. The Panzar-Rosse (also referred to as the H-statistic in this literature) is calculated from a modified revenue function with a vector of input prices and other bank variables representing explanatory variables (Hamza, 2011). Adding elasticities of revenue with respect to production factors' prices equals to the H-statistic (Bikker, Shaffer, and Spierdijk, 2009).

Comparing the three models of competition in developed and developing countries, the Panzar-Rosse prevails to be one of the most used tools to evaluate competition in the banking market. The Panzar-Rosse may be either applied in a country or international setting. For instance, the mode was used by de Rozzas (2007) to evaluate Spain's banking market also Shaffer and Spierdijk (2013) assessed the duopolistic market of Dewey Country of Dakota for the period of 1976-2010. Conversely, Bikker *et al.* (2009) assessed the banking sector for 67 countries

using data from 17 913 banks. Casu and Giradone (2006) tested the effect of merging on banking competition of the European Union's (UN) banking sector for the period 1997-2003. In general, higher numbers for the H-statistic indicate higher levels of competition (with a negative value or 0 indicating a monopoly and 1 indicating perfect competition).

On the other hand, Claessens and Laeven (2004) used data from 55 countries for 54 038 banks on a yearly average. In the context of developing economies, Mlambo and Ncube (2011) evaluated the transformation in the South African banking market utilising firm-level data for the period from 1999 to 2008. Further, Simpasa (2013) studied the banking sector of Zimbabwe, and Ye Xu and Fang (2012) studied that of China. Duncan and Langrin (2002) evaluated the banking market of Jamaica. Molyneux *et al*. (2001) assessed the bank's competitive conditions using non-structural measures using the Panzar-Rosse H-statistics. Included in the sample are the banks in France, Germany, Italy, Spain, and United Kingdom (UK) in the '90s. Findings show monopolistic except for Italy, and results were inconclusive about the monopoly hypothesis.

Other cross-country studies by Bikker and Groeneveld (2000) assessed the banking industry in South Africa banking sectors generally and concluded that South African banking sectors are operating in monopolistic competition. In support, Haaf and Bikker (2002) tested competitive conditions and market structure for 23 countries around the year 2000 and discovered monopolistic bank competition for all the countries. From the results obtained from these scholars, it can be concluded that small banks operating a business in local markets account a weaker competition as compared to bigger banks doing business in national markets.

i. **Advantages of H-statistic model**

The H-statistic is easily measured by the linear regression model, and it requires only a limited number of observations (Shaffer and Spierdijk, 2013). Furthermore, the H-statistic infer the degree of competition from the observed behavior of banks, as stated by Soledad and Peria (2010). The H-statistic infers competitive behavior or market type from the elasticity of revenue to input prices—that is, how sensitive revenue is to changes in firms' costs (Soledad and Peria, 2010).

ii. **Disadvantages of H-statistic model**

The H-statistic is not easily identifiable and requires verification of most assumptions (Shaffer and Spierdijk, 2013). The H-statistic uses price information, and monopoly power could be disadvantaged by monopsony power (Shaffer and Spierdijk, 2013).

2.2.7 Conceptualisation of Financial Stability

Financial stability occurs when the financial markets and the financial institution system are unaffected by economic shocks and well to fulfil its fundamental functions being the intermediation of financial funds, management of risks, and the arrangement of payments (Brian, 1951). Financial stability is currently a fundamental topic amongst those discussed in modern literature (Brian, 1951). An analysis of financial stability was recognised as relevant and significant during the international financial crises towards the beginning of the 2000s. However, its materiality was exacerbated by the financial and economic crises that emerged from 2007 to 2009 (Koetter *et al.*, 2012). Following these changes, an updated, reliable, professional opinion of the country in question is needed.

The analyses of financial stability must cover all the aspects of financial intermediary. Meaning it is also relevant to analyse other non-bank institutions. Analysing the stability of the institutional system enhances the analysis to cover the potential of the whole system towards resisting internal and external factors. The analysis of financial stability is a complex task. When branches are analysed individually, it jeopardises the results (Deabes, 2004).

Bank soundness is defined by Moyo (2018) in the study examined the impact of competition, efficiency, and soundness within the South African banking sector as the lack of the macro-economic costs of unsettling influences within the framework of budgetary trade between families, businesses, and financial services firms. A good banking system guarantees the ideal allotment of capital assets to avoid exorbitant banking system framework problems and their related unfavourable input impacts on the genuine economy (SARB, 2017).

The financial stability of the bank may be influenced by internal financial system risk or shocks that are external from the economy (Deabes, 2004). As a result, bank competition becomes relevant to enhance the degree of fairness and encourages banks to continuously provide quality services at reasonably lower prices (Deabes, 2004). This makes bank competition play a major role in economic growth and positive financial stability of the bank (Brian, 1951). Bank competition further offers a variety of services to the consumers (Brian, 1951). It is suggesting that through competition, corruption and rent-seeking can be manageable, which could assist the banking sector in accomplishing positive economic desires (Brian, 1951).

Claessens and Laeven (2004) claimed that financial reforms enhance the competitiveness of the financial sector and better its role in mobilising and allocating resources resulting in financial stability. Whereas Allen and Gale (2000) argued in opposition that financial reforms that encourage competitiveness have the capacity to disturb financial markets and enhance the chances of vulnerability to crisis.

2.2.7.1 Economic growth and Financial Stability

The importance of finance in economic growth and development follows the works of Schumpeter (1912); Goldsmith (1969); McKinnon (1973). The growth in the financial sector is material towards mobilising savings by firms that are essential for the production process (Schumpeter, 1912). As a result, firms demand more finance for economic growth. According to King and Levine (1993a, 1993b); Levine and Zervos (1998), when assessing the influence of financial development on stability its essential to consider three main categories, namely, degree of intermediation, efficiency, and composition. The category degree of intermediation is estimated using bank credit size to GDP ratio and to the stock market.

The impact of the financial market on economic growth can be either impermanent or permanent, depending on the form of the theoretical framework utilised. In the case of traditional growth theory, the impact lasts for a short period of time. In contrast, the new theories of endogenous growth suggest that the impact is permanent (Deabes, 2004). For instance, banks can boost the economy to the extreme level for economic growth.

Empirically, there is no universal conclusion by the economists relating to the link between financial stability and economic growth, which creates more room for discussion around this topic (Bekaert *et al.*, 2004). Referring to the number of emerging studies supports that there is a significant relationship between the banking sector and economic growth. In support of this statement are viewed by the authors like Bekaert *et al.* (2004); Capasso (2004); Otchere (2005). According to Monnin, Using Feds forecasts data, we show that banking sector stability (instability) results in a significant underestimation (overestimation) of GDP growth in the subsequent quarters.

Ferguson (2002) further claimed that financial instability is best characterised by market failure that severely affects real economic activity. In support, Cheang (2004) assessed the status of financial stability and its relation to the macro economy. The researchers are more of the view that the cost of financial crises is normally typically observed than the benefits of financial stability to an economy (Cheang, 2004).

2.2.6.2 Financial Stability and Profitability

Probability emerges from two words including, profit and ability (Tulsian, 2014). Profit refers to a financial gain, especially the difference between the amount earned and the amount spent in buying, operating, or producing something (Tulsian, 2014). Profitability has been indicated by several financial measures such as the return on assets, return on equity, and yield on earning assets, the rate paid on funds, and interest margin (Gardner and Mills, 1994). Return on assets (ROA) is mostly used as a general index of profitability since it is a financial ratio employed to evaluate the link between profits and earnings and total assets (Athanasoglou, 2006).

Generally, all businesses have the purpose of making a reward out of it (in form of turnover) and boost the economy of a country and financial stability. Also, Banks are financial institutions aiming to accumulate turnover for their owners (a reward), to enhance the financial system, boost economic growth and financial stability (Aduda and Gitonga, 2011; Hatter *et al.*, 2015), which promotes a profitable banking system which helps to avoid economic shock and endorses a conducive environment for an improved financial system (Athanasoglou *et al.*, 2008; Banga, 2013; Hatter *et al.*, 2015). Therefore, the theory of franchise value by Martynova *et al.* (2014) becomes relevant since it emphasises that economies with well banking system grow quicker than those with an undeveloped banking system (Hatter *et al.*, 2015).

Profitability is one of the factors that is impacted by measure financial stability (Tulsian, 2014). The financial stability of the banks plays a pivotal role in the financial system (Tulsian, 2014). Evidence shows that South Africa is one of the Southern African Developing Countries (SADC) countries where the banking sector contributes the most to the financial system (Hatter *et al.*, 2015). The financial stability of the banks can be reliably measured through either profitability or the Z-score (Martynova *et al*., 2016). This is supported by researchers such as Motelle (2014), who used both profitability and the Z-score as the measure of financial stability for the financial system using data from 2006-2010. Found that South Africa recorded an increase in the financial stability of 26.98 percent, reflected by a higher Z-score (Motelle, 2014).

The profitability of a bank is more relevant to the soundness and stability of the bank's financial system. The bank's profits proxy to soften the effect of an impact on financial stability caused by negative shocks (Micco and Panizza, 2005). The evidence shows that South African banks were profitable in a period from 2000-2015 (excluding the period of the financial crisis, 2007-08) since no bank experienced a negative return on assets and equity.

Contrary to the traditional beliefs of corporate finance models, Martynova *et al*. (2016) and Meiselman *et al*. (2020) argued that profitable banks have higher incentives for taking risks and, thus, are more likely to accumulate higher systematic risks. In contrast, Xu *et al.* (2019) revealed that higher profits reduce the idiosyncratic and systemic risk of the banks, even though high noninterest income, leverage, and wholesale funding contribute to an increase in these risks. Boyd and Runkle (1993), however, did not find any evidence of large banking firms failing less than small ones, even though there was an inverse relationship of bank size with risk.

Probability of default is a financial term describing the likelihood of a default over a particular time horizon that provides an estimate of the possibility of profit that will be forgone due to the borrower's inability to meet its debt obligations (Micco and Panizza, 2005). On the other hand, as banks obtain the market power, their ability to engage in risky activities expands (Boyd and Runkle, 1993), which means that the bank will engage in more risky activities and compromise profit which will negatively affect financial stability (Boyd and Runkle, 1993). The competition-stability hypothesis is against the idea that financial stability deteriorates the more competition tightens since banks with more market power have an advantage of charging higher interest rates on loans and earn more rents (Micco and Panizza, 2005). Stiglitz and Weiss (1981) claimed that higher interest rates might results in risky defaulted returns and, even worse, encourage unsafe lending and discourage safer borrowers, which results in jeopardised financial stability.

i. **Advantages of Profitability**

The profitability index (PI) is easy and simple to calculate. As a result, makes it is a common and often used technique to assess various investment proposals (Stiglitz and Weiss, 1981). It focuses on the profitability of the firm and always considers the risk factor (Stiglitz and Weiss, 1981). It is useful towards maximization of the value of the bank (Micco and Panizza, 2005). Thus, it provides estimates for the time value of money and evaluates the present value of money of future cashflows.

ii. **Disadvantages of Profitability**

It is complex to find the cost of capital and interest rate to obtain the profitability indicator of the (Stiglitz and Weiss, 1981). Possibility of drawing incorrect decision while comparing mutually exclusive capital projects (Stiglitz and Weiss, 1981). It is hard to measure the stability of the bank having different estimated profits (Stiglitz and Weiss, 1981).

iii. **Additional measures of profitability**

One other proxy of profitability as a financial stability measure of the banking sector that has been stated in a few studies such as Ho and Saunders (1981); Saunders and Schumacher (2000) are the net interest margin (NIM) and the return on asset (ROE) (Saksonova, 2014). The NIM is the disposable income, given by the ratio of disposable interest income to the bank's average income (Osuagwu, 2014). Thus, it portrays the profitability of bank's credit dealings and policies (Osuagwu, 2014). In order to calculate the net interest margin (NIM), the net interest income is material relevant to calculate (Osuagwu, 2014). Several researchers, such as Lee *et al.* (2014); Nguyen (2012); Basir (2000), have applied NIM to measure profitability. However, for the banking sector, the ROA prevailed to be more evident when assessing the bank than the other two variables, such as NIM and ROA. The net income and the shareholder's equity can be obtained from the statement of comprehensive income (SOCI) (Figo, 2015).

The NIM is calculated using the equation, NIM = [Disposable interest income (Investment returns - Interest expense) / Average income assets] *100. According to Basir (2000), an extreme ratio of NIM is good since it shows a positive quality of management reflecting on profitability.

The second alternative measure of profitability is the return on equity (ROE). The ROE is the measure of financial performance through the evaluation of the profitability of a corporation in relation to stockholders' equity (Osuagwu, 2014). The ROE is calculated by dividing net income (referred hereto as disposable income) by total equity capital (Osuagwu, 2014). The disposable earning is represented by the after-tax profit. The shareholders' equity is equal to a company's assets minus its debt. The total equity capital was explained by Moyloux and Thornton (1992) as the aggregate of undistributed net profit and the shareholders capital that was used, which are in line with a study conducted by (Guru 1999). Thus, the ROE is considered the return on net assets Moyloux and Thornton (1992). It has reached more than 11 percent, for the first time in a while, after the global financial shock that occurred from the year 2007 to 2009.

Further, year-to-year values were used to accommodate the variation of these variables, and basic averages are used for the end-of-year values. Information about both net income and the shareholder's equity can be obtained from the statement of comprehensive income (SOCI). The

Formula to calculate is ROE = [(Disposable earnings)/ (Total equity capital) *100], following the trails of Osuagwu (2014). The ROE ratio of 1 percent represents the good performance of the bank. Below zero, it a sign of a poorly performing bank (Moyloux and Thornton, 1992).

2.2.6.3 Return on Asset (ROA) as a Measure of Bank Performance

Investments are estimated as per their return or return potential. The return for an asset is measured in many ways (Collins, 2017). Normally, the return is calculated by dividing the profit from the investment by the cost of the investment. This is also the case for return on assets (Collins, 2017). The ROA is an estimate, also based on accounting data (Boyd, De Nicoló and Jalal, 2006). The ROA is used to proxy for the Z-score. For instance, a bank's *Z*-score declines if the variability of earnings increases. Higher profitability and capitalization levels increase a bank's *Z*-score. Among others, Elton (1999) questions whether realized returns are a good indicator for future performance and returns. Like the alternative measures discussed so far, the *Z*-score does not consider actual failure of banks (Beck, 2008).

i. Advantages of ROA as a Measure of Bank Performance

The ROA is a metric that habits operating income to effectively capture the impact of equity and debt financing on asset purchases and associated potential to make a profit (Collins, 2017). Thus, banks with different capital structures can be compared without any adjustment (Collins, 2017). It is also vital to evaluate the potential of the bank's management in using the available assets (Collins, 2017).

ii. Disadvantages of Return on Asset (ROA) as a Measure of Bank Performance

The Return on Asset (ROA) is a financial metric that is less useful to companies that belong to capital intensive market or service-based companies (Collins, 2017). The capital-intensive market needs a substantial investment of the profit in regular capital expenditure requirements resulting in less value. On the other hand, service companies invest less in assets that result in a large ROA (Collins, 2017). There is a lack of a simple description concerning the treatment of the numerator employed in the ratio (Collins, 2017). Some banks use the operating income, yet others utilize net income.

Further, it does not describe how the assets were financed. A bank with a high ROA may still be in financial straits if all the assets were paid for through leveraging (Bannerjee *et al.*, 1998). Subsequently, the total assets are defined by the carrying value of the assets instead of the market value, which could cause a discrepancy of providing misleading numbers in the carrying and market value of the assets. Lastly, there is no system of measurement to obtain a good or bad ROA. Banks in a capital-intensive market have lower ROAs compared to those who not. The ROA is all contextual to the bank, the market, and lastly, the economic environment.

2.2.6.4 The Z-score as a measure of financial stability

Financial stability is not straightforward to measure; however, literature mainly proposes Z-score as one of the alternatives that could be used to measure financial stability (Diaconu and Oanea, 2015; Alshubiri, 2017; Ozili, 2018). Theory on Z-score describes it as the relevant measurement variables, namely price and marginal cost (Ozili, 2018). Cihak and Hesse (2008) viewed Z-score to be amongst the most efficient statistical tools used to measure a bank's soundness and stability (Odeduntan, Adewale, and Hamisu, 2016).

According to Hatter *et al.* (2015), which investigated the effect of banking competition and financial stability on the Turkish banking sector between 2002 and 2012. The two indicators of bank competition were utilised, namely, the Boone indicator and the Lerner index (Hatter *et al.*, 2015). To estimate the financial stability, the study used non- performing loan ratios and Z-score (Alshubiri, 2017). The findings reflected a negative link between bank competition and the non-performing ratio, causing inconsistency between the correlation between bank competition and financial stability (Alshubiri, 2017). Inverse findings prevailed between competition and Z-score correction investigation (Alshubiri, 2017). The findings offer evidence that supports the financial-fragility theory by Carter (1989). The financial fragility theory is further elaborated by Cihak and Hesse (2008) to claim that bank competition and non-performing loan ratios have an inverse correlation. From this theory, a bank's risk-taking advantage is affected by a rise in bank competition (Cihak and Hesse, 2008). A good practical example for explaining this theory would be a case for the perfect competition where profits of banks are maximised at zero and investment offerings are fair for a large number of clients (Hatter *et al.*, 2015). This results in no fear of loss by the banks (Keely, 1990).

Tabak *et al.* (2012) used data from 10 Latin American countries between 2003 and 2008 to investigate the impact of bank competition on financial stability and proved that if the two hypotheses of bank competition can be true at the same time. The study applied the Boone indicator as to the key estimator of competition and a slightly modified version of Z-scores as a measure of financial stability and overall risk (Tabak *et al.*, 2012). Tabak *et al.* (2012) result justified that either with a low or high degree of bank competition, financial stability can improve. Thus, despite the degree of bank competition, both hypotheses can hold simultaneously (Cihak and Hesse, 2008). Further findings claimed that those banks which are classified as average are the ones engaging in high-risk transactions and earn large turnover or profit. This effect can be better explained by the amount of shareholder capital (Tabak *et al.*, 2012). The impact of shareholder capital varies with the degree of competitiveness in the market (Cihak and Hesse, 2008). For instance, shareholder capital works as a dominant strategy for maintaining financial stability, mostly in the less competitive banking sector, although in a more competitive sector backs financial stability for large banks (Cihak and Hesse, 2008).

Shahid and Abbas (2012) used the Z-score and econometric model to analyse the financial stability of Islamic banking in Pakistan using data from bank scope financial statements for the period 2006 to 2009 for all the existing to six banks existing in Pakistan and the highest ten banks according to the Credit Rating Agency, found small scale Islamic banks had more strength compared to both large Islamic banks and small conventional banks. Also, that large-scale Islamic banks were stronger than large conventional which is the opposite of Cihak and Hesse's (2008) results.

i. **Advantages the Z-score**

One of the advantages of the Z-score is that it can also be used for institutions for which more sophisticated, market-based data are not available Boyd and Runkle (1993); Beck, Demirgüç-Kunt, Levine (2007); Demirgüç-Kunt, Detragiache, and Tressel (2008); Laeven and Levine (2009); Čihák and Hesse (2010). Also, the Z-scores allow comparing the risk of default in various groups of banks, which may differ in their stewardship or objectives, although, face the risk of insolvency (Čihák and Schaeck, 2010).

ii. **Disadvantages of the Z-score**

The main limitation is that the Z-scores are mostly accounting data (Čihák and Schaeck, 2010). Hence, best measure the underlying accounting and auditing framework Boyd and Runkle

(1993); Beck, Demirgüç-Kunt, Levine (2007); Demirgüç-Kunt, Detragiache, and Tressel (2008); Laeven and Levine (2009); Čihák and Hesse (2010). When the bank can smooth out the reported data, the Z-score may give out an excessively positive assessment of the banks' stability as indicated by Boyd and Runkle (1993); Beck, Demirgüç-Kunt, Levine (2007); Demirgüç-Kunt, Detragiache, and Tressel (2008); Laeven and Levine (2009); Čihák and Hesse (2010). Furthermore, the Z-score individual bank in isolation, probable undermining the risk that a default in an individual bank may result in loss to other banks (Demirgüc-Kunt and Detragiache 1997; Kaminsky and Reinhart 1999).

2.2.8 Macroeconomic Determinant and Bank Specific Factors

This study used several structural and non-structural measures of competition as well as the two measures of financial stability to investigate the relationship between bank competition and financial stability. To obtain the results that are more relevant, this study has considered the macroeconomic determinant and the bank-specific factor. These are control variables of the study model, which are referred to as bank size and economic activity (proxied by GDP), which were used by Ijaz, Hassan, Tarazi, Fraz (2018) in the study, linking bank competition and financial stability and economic growth. The bank size and economic activity literature are reviewed in the next subsection.

2.2.8.1 Bank Size, and bank performance and stability

The firm size is considered the most significant factor of firm profitability (Spathis, 2002. Larger firms are said to be able to produce goods more cheaply as compared to small firms (Kigen, 2014). Reason being the fact that previously it has accomplished more learning, greater cumulative experience, and able to spread fixed costs over a greater amount of production (Kigen, 2014).

In this study, the bank size is estimated using the logarithm of total assets as proposed by Aggarwal and Jacques (2001). Various studies such as Athanasoglou *et al.* (2008); AL-Omar and AL-Mutairir (2008); Ashraf (2012); Perera *et al.* (2013) viewed bank size to have a direct effect on profitability. The connection between bank size, as a measure of profitability, and bank financial stability is best explained through the agency theory of the firm (Jensen and Meckling, 1976). The root of the agency theory by Jensen and Meckling (1976) is that owners and managers of the bank have incompatible goals with the latter postulated as running the bank to pursue their personal aggrandizement at the expense of the former. In other words, the theory submits that the decisions and actions of managers are inordinately skewed towards

personal gains. The link to both bank size as a measure of profitability and bank stability can be understood in the context of the agency theory of the bank. The agency theory by Jensen and Meckling (1976) claimed that owners and managers of the bank have the same vision with the latter hypothesized as running the firm to pursue their personal exaggeration at the expense of the found of the bank. In short, the theory states that the decisions and actions of managers are more towards personal gains then for the entire banking sector or economic benefit.

The stewardship theory offers one of the best explanations for defining the possible relationship between bank size and bank stability (Madison, Holt, Kellermanns and Ranft, 2016). This theory is of the idea that managers are fundamentally trustworthy to the firm, which them predisposed to misuse the resources of the firm (Davis, Schoorman and Donaldson, 1997). The theory suggests that there are non-financial promoters. Thus, corporate managers are realised as having the desire to achieve, in order to gain essential gratification through effective implementation of essentially challenging work, which will enable exercise of responsibility and authority to draw the attention of the management (McClelland, 1961). On the other hand, the theory argues that a corporate manager is to find a course of action personally unrewarding. Nonetheless, they are likely to pursue it from a sense of duty. This compliance with duty when there is no personal reward is referred to as normally induced compliance (Etzioni, 1975). When corporate managers believe that their fortune is with their present employers in terms of future employment or pension rights, their interest may be aligned with that of the firm and its owners regardless of share ownership (Donaldson and Davis, 1991). In short, stewardship theory suggests that expanding size is symbolised by structural convenience, which may improve stability. Logically, the stewardship theory predicts a positive relationship between bank size and bank stability.

The effect of profitability proxied by the bank size on bank stability is likely to be analysed through concentration-stability and concentration-fragility hypotheses (Uhde and Heimeshoff, 2009). One of the concentration-stability hypothesis channels argues that larger banks in concentrated banking sectors eliminate financial fragility through improved profits, constructing extreme capital buffers (Boot and Thakor, 2000). They are causing big banks to be less vulnerable to liquidity or macroeconomic shocks (Mirzaei, Moore, and Liu, 2013). In short, the argument is more about that size encourages improved variation, which lowers risks and allows banks to support their operations with less capital and less-stable funding (Laeven et al., 2014). Thus, the prediction of the concentration-stability hypothesis is that there is a positive correlation between bank size and bank stability.

A study by Redmond *et al.* (2007) investigated the effect of bank size on profitability. The banks were grouped banks into five (5) as per the size of assets using ROE ratio to proxy for profitability and found that there is a significant negative link between profitability and the volume of assets (Redmond *et al.*, 2007).

Kasimodou *et al*. (2006) investigated the bank's efficiency of the UK, considering the bank size as a main factor grouped UK banks for two types, large and small, according to assets volume. The study found that small banks performances higher compared to large banks. Banks' performance and worthiness of investments are mainly evaluated through the trend and pattern of profitability. Murthy (2008) assessed the bank's income and profitability of the gulf cooperation council countries (GCC) using data for 78 banks from 2002 to 2008. The study had many aspects that might be relevant to profitability results in the gulf region. The bank size was seen as the factor that affects the profitability of gulf banks (Murthy, 2008). The profitability of other banks prevailed lager than of others.

The first advantage is that size allows better diversification, reduces risks, and allows banks to operate with lower capital and less-stable funding (Brownlees and Engle, 2012). It may also facilitate market-based bank activities. The second angle is that large banks may operate in a different market segment than small banks (Acharya, Engle, and Richardson, 2012).

2.2.8.2 Economic Activity, and bank performance and stability

Economic growth is considered to be an essential means for poverty alleviation and improving countries' well-being. Disturbances and instability in the banking sector may jeopardize financial stability and generate adverse, considerable, and long-lasting consequences therefor. The growth is measured by the economic activities that occurred over the period, which contributes to the gross domestic product (GDP) of a country. The annual actual gross domestic product (GDP) has been used by many studies, including Pasiouras and Kosmidou (2007); Marijana *et al.* (2012); Masood, Ashraf, and Ashraf (2012); Francis (2013); Ongore and Kusa (2013); Petria *et al.* (2015); Saona (2016); Singh and Sharma (2016); Rani and Zergaw (2017) as a macroeconomic factor as well as the usual indicator used to measure aggregate economic activity within an economy.

Financial stability makes a great effort towards assisting stakeholders accomplish their risks quickly and contributes to their efficient use of financial resources to enhance economic growth (Hoggarth *et al.*, 2002). Further, other scholars such as Jokipii and Monnin (2013); Creel *et al.* (2015) claimed that financial stability and macroeconomic strengthen one another.

Countries that experience economic decline results in banking operations and business activities in jeopardy. Thus, it is for this reason that economic growth is associated with an increase in financial stability. (DellAriccia *et al.*, 2008; Cave *et al.*, 2019; Wang *et al.*, 2019). Thus, the GDP is used in this study to control for economic activity that affects stability.

Scholars such as Cetorelli and Gambera (2001); Claessens and Laeven (2005) investigated the link between bank competition and economic growth. Recent studies on bank competition and concentration measures for economic growth in a sample of 41 economies. Found that concentration has an overall negative effect on economic growth that affects all industries.

De Guevara and Maudos (2011) investigated the impact of bank competition on economic growth, using non-structural and structural indicators of competition for 21 countries. Found that financial development enhances economic growth. Soedarmono *et al.* (2011) assessed how bank competition affects financial stability and the influence of market power on financial stability in the banking sector of Asia. The findings show that monopolistic competition contributes positively towards financial stability (Schnitzer, 1999; Albaity *et al.*, 2019).

2.2.9 Theorical framework

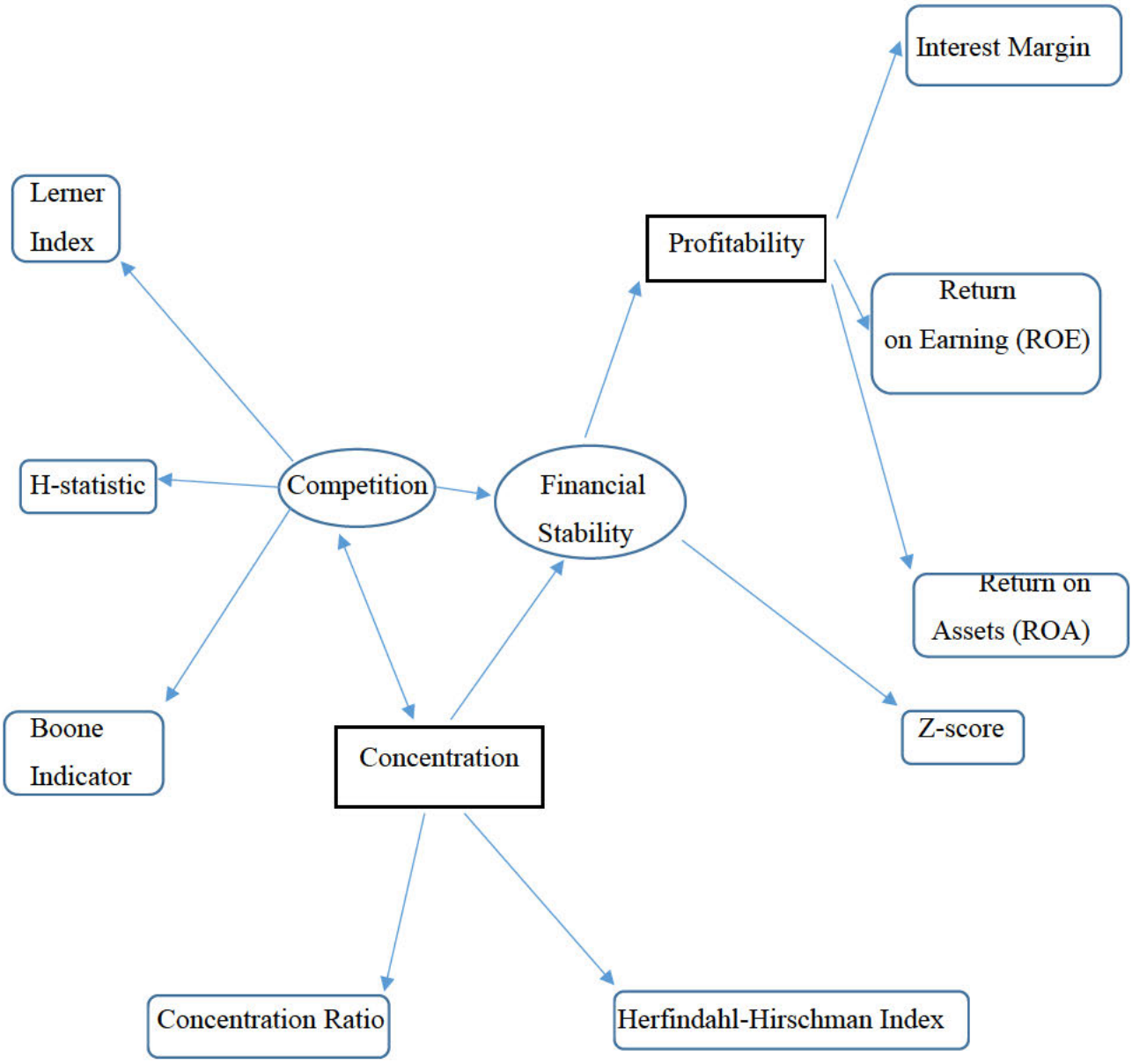


Figure 2.1: Conceptual Framework for Bank Competition/ Stability Relationship

Source: Author's construct (2021)

Figure 2.1 above shows the conceptual framework for bank competition and financial stability relationship. It has been developed from the review of theoretical framework and models of scholars such as Bikker and Haaf (2002); Berger, Allen and Gale (2004); Demirgüç-Kunt, Levine and Haubrich (2004); Claessens and Laeven (2004); van den and Tabbae (2005); Beck, Demirgüç-Kunt and Levine (2006); Berger, Klapper, and Turk-Ariss (2008); Doll (2010). These researchers evaluated the relationship between bank competition and financial stability.

The scholars (Claessens and Laeven, 2004) used the non-structural measures of competition, including the Lerner index, Boone indicator, and the H-statistic. Additionally, Allen and Gale (2004) proposed using the profitability and the Z-score as financial stability measures. The profitability can be proxied by the different measures, including interest margin (NIM), return on equity (ROE), and the return on assets (ROA) (Boyd, De Nicoló and Jalal, 2006). However, due to the objectives of this study, only the ROA was be expanded on and used to proxy profitability as a measure for financial stability since it is fundamental to investors when making an assessment (Fargo, 2015). De Nicoló, Bartholomew, Zaman and Zephirin (2003) suggested using the Z-score to measure the financial stability in the banking sector. Furthermore, Beck (2008) argued that this might imply that concentration might positively affect financial stability through other channels than the lack of competition, such as increased diversification possibilities supported by various cross-country studies.

2.3 Empirical Studies on Competition, Concentration and Financial Stability

The empirical evidence of the literature on bank competition and bank stability link provides complex results. This speaks volumes regarding some of the methodologies used by other researchers to investigate the correlation between bank competition and financial stability of banks as one of the main causes in simplicity and the timing used.

This part of the literature covers the empirical evidence from similar studies that were done, particularly for the countries abroad, since on the South African side, there are few studies that were conducted before that measured the topic in concern.

The study will first provide evidence that supports the competition fragility hypothesis and then empirical evidence in the secondment of the competition stability hypothesis. Then this study further provides evidence on how concentration and market power affect financial stability.

2.3.1 Empirical Evidence on Concentration and Financial Stability

Various studies, including Beck *et al.* (2009), which investigated a link between bank concentration and financial stability using a sample of twenty-nine countries between 1980 to 1997, found results that are in favour of the concentration stability view, where the results point to a high level of concentration as a solution to Asian financial crisis. This concludes that concentration enhances financial stability (Beck *et al.*, 2009).

Another study by Boyd *et al*. (2009) also investigated the link between bank concentration and financial stability, using the same sample used by Keely (1990), who reached an inverse relationship amongst the two variables. Although, the magnitudes of the parameters are not material. The observations of the researchers in this study are that concentration is detrimental to the financial stability in the banking sector.

Empirically, not much attention has been given to the size measure of profitability and stability. So has been more on how competition affects bank stability (Amidu and Wolfe, 2013; Beck, De Jonghe and Schepens, 2013; Fiordelisi and Mare, 2014). A study that directly assesses the size–stability connection is Laeven *et al.* (2014), which analyses the correlation between bank size (profitability) and bank stability with data from 52 countries and found that big banks, on average, generate too many risks compared to smaller banks. Köhler (2015) analysed the effect of business models on bank stability within the EU banking sector for the period between 2002 and 2011. Mostly the study reported that bank size has a major negative impact on profitability, hence bank stability. This implies that smaller banks are more stable than bigger banks. Although, a study by Altaee, Talo, and Adam (2013) investigated the stability of banks in the Gulf Cooperation Council countries and found, among other things, that size (proxied by total assets) to measure profitability has no major statistical impact on bank stability. In short, the above proves that the relationship between size and stability is inconclusive. Meaning, that there is a need for further investigation of this relationship into how the size of a rural bank affects stability.

2.3.2 Empirical Evidence on Bank Competition and Financial Stability

Various previous studies that measured the impact of competition on financial stability for banks mostly targeted international countries, particularly the United (US) banking system. Keely (1990) assessed the impact of bank competition by utilising data from 150 dominant banks. Found that a rise in bank competition results in a decreased market power and weakened financial stability resulting in bank failures in the U.S.A (Keely, 1990). The study by Fungacova and Weill (2013) investigated the relationship between bank competition and financial stability using the quarterly data from 2001 to 2007. Found that bank competition results in a decrease in financial stability (Fungacova and Weill, 2013), supporting the competition fragility hypothesis. These findings supported the competition fragility hypothesis stated in the previous section.

The study by Jimenez *et al.* (2013) focused solely on the evaluation of the relationship between bank competition and loan portfolio risk, guided by estimations of non-performing loan ratios as an alternative to aggregate financial stability evaluated by the Z-score. The study used precise measures of bank competition such as those of loan and deposit market concentration as well as product-level indices. Findings are in line with those of Maritinez-Miera and Rapullo (2010), which showed an inconsistent link between the variables. For the loan markets, results show that when the market power decrease, the non-performing loan ratios also decline to a certain level before expanding (Maritinez-Miera and Rapullo, 2010).

These results produced by using the Lerner indices show an inverse relationship between the market power in the relevant loan market and the non-performing loans (Maritinez-Miera and Rapullo, 2010). This gives backing to the findings of Boyd and De Nicolo (2005), which are in line with the franchise value paradigm instead of the risk-shifting paradigm by Maritinez-Miera and Rapullo (2010). The conclusion on the relationship between bank competition and financial stability is technical to draw from their findings since they only use a single aspect of a bank's risk profile. As a resolution, this study attempts to evaluate the effect of competition in a broad way by employing similar indicators of bank competition and assess its effect on overall risk measure (Z-score) and the relevant parts representing portfolio risk.

The evidence from international studies mostly supports the competition fragility hypothesis. For instance, a study by Yeyati and Micco (2007) used a sample of eighty (8) commercial banks of Latin American countries to measure the link between bank competition and risk as a measure of financial stability, from 2003 to 2002 and found that banks that operate in a more competitive sector explore less financial stability.

The proposal was made by Berger *et al.* (2009) through regressing each measure and measure of competition (i.e., HHI loans, HHI deposits, and Lerner Index) across the country as an alternative to the region using data of 8325 banks across 23 developed countries. The study argued that funding the Statement of Financial Position by extra equity is commended for its overall risk of financial stability, notwithstanding the risk associated with non-performing loans. The supported competition fragility hypothesis is stipulating that a rise in banking competition negatively impacts financial stability. Also, in line with the competition fragility hypothesis, since proposing that an increase in bank competition has negative implications on financial stability. These results infer that positive effects of bank competition on financial stability can be recognised when there are major higher equity capital ratios. The way the

indicator of risk and financial stability used in previous studies proves that both hypotheses of competition may exist concurrently instead of opposing.

Alternative discovery by Tabak *et al.* (2002) claimed that both competition stability and competition fragility hypothesis could hold at once. The study used data from 10 Latin American countries for the period 2003-2008, and the findings showed an inconsistent impact of market power on the financial stability of banks (Tabak *et al.,* 2002). The study utilised the Boone indicator and Z-score to project market power and overall risk, respectively and discovered that both high and low degrees of bank competition could lend financial stability an opportunity to improve. This is in support of both the competition-stability and competition-fragility hypothesis, respectively. The finding of Tabak *et al.* (2002) is inconsistent, and the link is better explained by the shareholder capital phenomenon since banks with an average degree of competition prevails to engage in more risk and contributes to multi-roles varying the type of market. In a perfectly competitive market, shareholder capital helps boost the stability of the big banks, although in less competitive markets serves to controls banks to retain financial stability (Tabak *et al.*, 2002).

Bolt and Humphrey (2015) applied competition efficiency and used the three indicators of banking competition, namely, HHI, Lerner index, and H-statistic. Their study used a sample of 2655 banks and 382 financial institutions. Instituted that the three measures are uncorrelated, and in the US banking sector, the banks that charge fewer interest rates to consumers are more competitive (Bolt and Humphrey, 2015). Furthermore, Bolt and Humprey (2015) used the Lerner index and Boone indicator to measure bank competition and obtain a strong non-relation with the non-performing loan ratio of banks. From the above evidence, it is concluded that all three variables measure bank competition uniquely. Thus, given the presented findings above, the financial fragility is supported.

A number of recent remarks from cross-country studies prove that the relationship between bank concentration, bank competition, and bank system delicacy is vague, i.e., Beck, Demirguc-Kunt, and Levine (2006) discovered that the probability of money related emergencies is low in a more concentrated banking system, although high in slightly competitive banking systems and nations with less advanced lawful systems.

2.3.3 Gap in Empirical Literature

Taking from the empirical literature reviewed, there is an existing gap resulting from the conflicting findings by different scholars who perused to understand the relationship between competition and financial stability.

Bolt and Humphrey (2015) applied competition efficiency and used the three indicators of banking competition, namely, HHI, Lerner index, and H-statistic. Their study used a sample of 2655 banks and 382 financial institutions and obtained results which are in support of the financial fragility is supported. Keely (1990) assessed the impact of bank competition by utilising data from 150 dominant banks. Found that a rise in bank competition results in a decreased market power and weakened financial stability resulting in bank failures in the U.S.A (Keely, 1990). Found that bank competition results in a decrease in financial stability (Fungacova and Weill, 2013), supporting the competition fragility hypothesis.

In contrast, discovery by Tabak *et al.* (2002) claimed that both competition stability and competition fragility hypothesis could hold at once. The study used data from 10 Latin American countries for the period 2003-2008, and the findings showed an inconsistent impact of market power on the financial stability of banks (Tabak *et al.*, 2002) which used the Boone indicator and Z-score discovered that both high and low degrees of bank competition could lend financial stability an opportunity to improve. This is in support of both the competition-stability and competition-fragility hypothesis, respectively.

Thus, the different findings by different scholars proves that there is still a lack of consensus amongst the literature of the bank competition and financial stability. Consequently, this provides a motivation for this current research study in this field.

2.4 Chapter Summary and Concluding Remarks

Economists believe that bank competition is vital for banking well-being and the economic development of the banks as well as of the country at large although a highly stringent degree of competition will unfavorably affect the innovativeness and exposure to new opportunities. The literature on banking proves that factors leading to banking competition are not directly evaluated, which means that as per the previous literature review, the number of banks in the South African banking sector, its concentration, and size need clear definition to enhance the process of evaluating the competition. In addition, the literature on banking competition consists of different variables such as market structure, contestability, and non-market structure

variables. Various researchers (i.e., Panzar, 1987) claim that the banking industry should be analysed with precision, and due consideration must be made towards restructuring as a result of the past global financial crisis.

This study has carefully examined and reviewed various studies analysing the literature of bank competition. Competition is crucial in different fields, especially the banking sector. The financial sector has become more advanced, as a result of technological advancements, for instance, information communications technology (ICT) developments. These advancements in ICT have created room for further research to gain more insight into the potential determinants of bank competition. The review of the literature in this study was aimed at identifying the importance of market structure variables and the non-market structure variables and their influence on bank competition which results in the impact on financial stability. The identification of these variables is of paramount importance towards understanding the key schools of thought, such as competition fragility and competition stability hypothesis. The literature review involved gaining insight and evidence on usage of key measures of competition such as Lerner index, Boone indicator, and HHI and these measures are non-structural variables. The study further gained an understanding of the use of concentration to measure the level concentration of the banking sector, which is a market structure conduct.

The chapter finds that sample size, country coverage, types of measures for stability and bank competition, estimation method, and publication characteristics are the key determinants of heterogeneity in projected effect sizes across studies. A large sample size tends to produce smaller bank competition predictions. The evidence from the literature showed that banking competition is strong, mostly in the developed countries. Although, the most focus should be directed towards understanding and measuring the bank competition in developing countries. Hence, the variables of bank competition will be more important due to the uniqueness of each market competition, the number of operating banks, and macro-economic conditions. Therefore, evidence reveal moderate negative publication bias, supporting the journals discriminating in favour of studies predict a negative relationship between bank competition and financial stability.

As a result of the varying economic conditions and market requirements for each country, the identification of the exact determinants of competition remains ambiguous. Given the antitrust regulations, decreasing barriers to market entry of foreign investment, and lack of restrictions of larger banks makes competition more stringent and deviate the financial stability of the

smaller banks. Although, there is no sufficient evidence from this chapter's findings supporting an opinion that competition contributes more to the country's banking sector towards financial stability. Thus, it is recommended that future research include empirical analysis to determine the real impact of competition on financial stability.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The sampling produces substantial research result. Though, with the differences that can be exist amongst a population and a sample, sample errors can arise. Hence, it is important to use the most relevant and useful sampling. This study's objective aimed to analyse the effects of bank competition on financial stability for the South African banking sector. This section outlines the research methods that were used in the study. It offers information on the participating banks, the criteria for inclusion of those banks in the study, and the sampling method used. This is done through estimating the measures of dependent and explanatory variables (competition, concentration, profitability, and financial stability). To achieve the referred above, a quantitative research design was adopted.

This chapter commenced by outlining the research design used in the study were defined, and motivation, as entailed by the objectives of the study, behind the proposed approach, would be discussed. Then, the section proceeds with the research approach and design, description of data (reasons for the nature of chosen data and their use towards achieving the desired objectives), population and sample size, the explanation of the variables. This is followed by the discussion of independent, dependant, and control variables. The final section summarises and concludes the chapter. Lastly, data analysis and model specifications are discussed. Thereafter, the chapter is concluded.

3.2 Study Approach and Design

Research approach refers to a plan and procedure applied by the researchers perusing a study. It serves as the framework for answering the identified research questions (Creswell, 1994). It is of vital importance to prick the right research approach then consequently implement it since this enables a correct guideline towards achieving the actual research design that would be utilized in the study. The study followed a choice of deductive approach (Trochim and Donnelly, 2006). The deductive approach refers to aimed and tested theory through empirical observations from the secondary data (Hussey and Hussey, 1997). The purpose of following the deductive method in this study was to test the existing theories of competition and its implications on financial stability. The bank competition indicators are conducted using the time-varying data, which creates time persistent competition measures that are also used in empirical literature to investigate the link between bank competition and financial stability.

3.3 Population and Sample Size

The study is quantitative research that required identifying the population size and selecting the appropriate sample size. Thus, this subsection started by defining the study population. The population of a study consists of a collection of all of the characteristics in which a study seeks to analyse. electing the population of a study is one of the most critical components of a study. It forms the basis of which characteristics are included in the study sample and which are rejected. Secondly, the subsection outlined the sample size and the period used in the study.

3.3.1 The Population

The South African economy is made up of several financial institutions, each with multiple sub-sectors such as mutual banks and retail banks. Each sub-category has financial institutions that offer unique products and services and contribute differently to the country's GDP. This study focused on the South African banking sector as a developed and well-regulated sector, which is currently made up of 36 South African banking institutions and 30 Foreign Banks with approved representative offices in South Africa, registered with the South Africa Reserve Bank (South Africa Banking Sector Report 2019/2020). From a brief review of the history, Verhoef (2009) reports that previously the financial sector was dominated by an oligopoly of British-owned banks such as Standard Bank and Barclays bank. The South African banking sector has been theoretically proven by Okeahalam (2002), Beck, Demirgüç-Kunt, and Levine (2003), to be concentrated by five large banks contributing more than 84 percent of an asset out of 19 commercial or retail banks, representing a high level of concentration in the industry empirically observed by Boyd *et al*. (2009) using the Herfindahl-Hirschman Index (HHI). Bank Annual Reports, from 1994 to 2011, showed that the South African banking sector has an HHI of more than 1800 since 2004 and never reached 1000 from that period till present (South Africa Banking Sector Report, 2021). An HHI of more than 1800 indicates a highly concentrated industry that suggests the possible presence of oligopoly behaviour, which is the South African banking sector (Mishi and Tsegaye, 2012).

The population size of this study includes all commercial or retail banks in South Africa. The commercial bank is a financial institution that allows deposits, offers to check account services, the processing of different loans, and offers primary financial products such as certificates of deposit (CDs) and savings accounts to personal and small businesses (Corporate Finance Institute, 2016). The South African banking sector is well established and controlled and meets the standard the developed countries. The commercial banks in South Africa comprise 19

registered banks, two mutual banks, 13 local branches of foreign banks, and 43 foreign banks (Banking Association of South Africa (BASA), 2011).

The five large banks were targeted for regression analyses and making conclusions about the correlation of bank competition and financial stability about the entire population of commercial banks. However, the South African banking sector is regarded as the most highly rated and classy by Mishi, Sibanda, and Tsegaye (2016), thus considered to be monopolistic and concentrated to five giant banks, namely Nedbank, Standard Bank, Absa, First National Bank, and Capitec (PWC, 2015).

The following subsection discusses the research population and sample size for this study and the justifications behind the choice of the sample size, and the relevant period.

3.3.2 The Sample Size and Sample Period

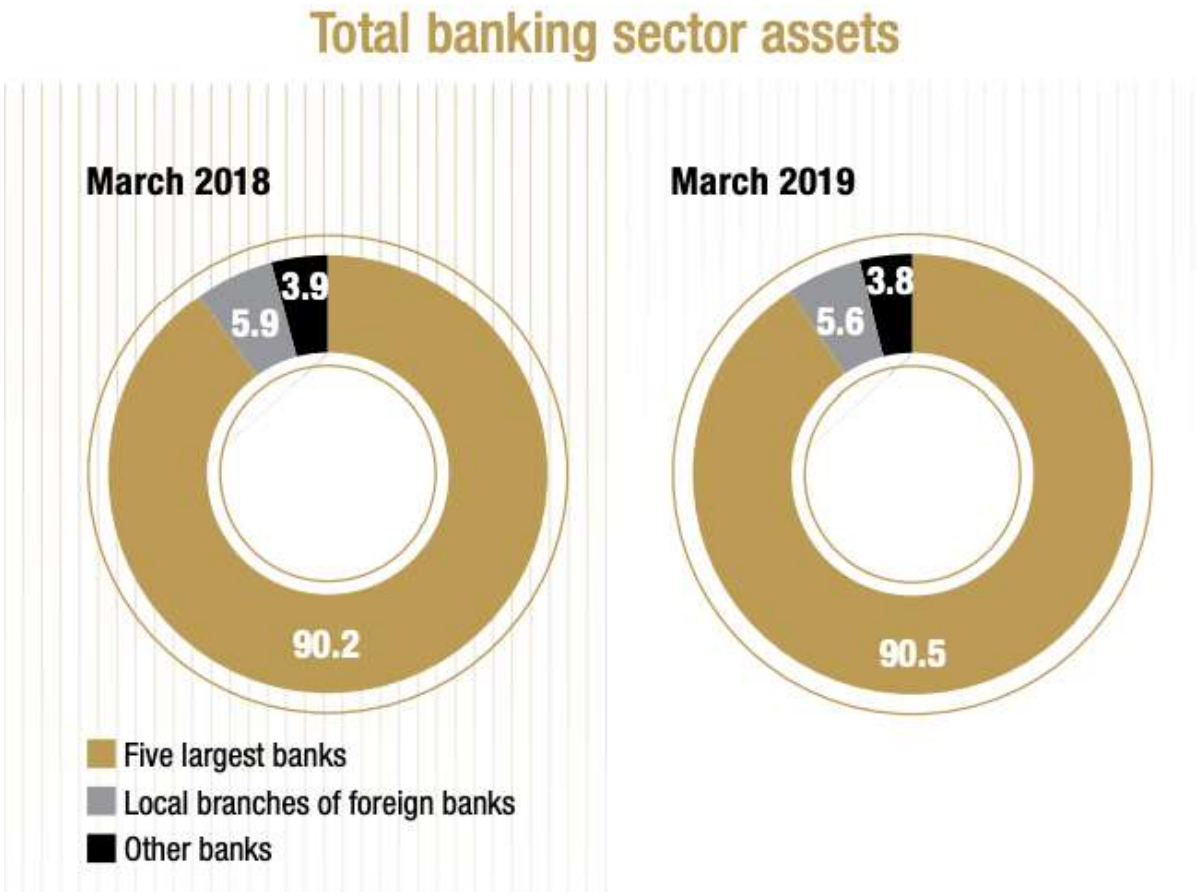
Sample generally refers to a portion of the entire group (labelled as population). The sample size is a term used in market research for defining the number of subjects included in a sample size. By sample size, the study understands a group of subjects that are selected from the general population and is considered a representative of the real population for that specific study. The sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample.

Sampling in this study contributed to efficient research findings. Although, there are differences between a population and a sample size that cause sample errors to occur. Hence, it is essential to utilize the most appropriate and suitable sampling method. There are many sampling methods to select a sample from the population, although the choice of each method depends on the purpose for the use of the sample. However, given the objectives of this study, namely, to assess the relationship between bank competition and financial stability, the study used the convenience sampling method to select the convenient banks given the limited availability of South African bank's commercial data.

The sample of this study was selected based on the criteria of the largest banks contributing more than 84 percent of the market share. It covers the five largest commercial banks in South Africa. Since these banks are regarded as owning a large market share, there is a strong positive representation of the entire market (Okeahalam, 2002; Beck, Demirgüç-Kunt and Levine, 2003). The structure performance conduct (SCP), including Herfindahl-Hirschman Index and Concentration ratios by Beck *et al*. (2009), was selected to measure the level of concentration

in the South African banking sector. The selection of banks chosen was supported by the percentage return on investment (ROI) (BASA, 2017). Hence, these five major South African commercial banks, which own 91 percent of the total assets, were used to provide a material view of the entire effect of bank competition and financial stability in the South African banking sector (ADV Rating, 2020; South Africa Banking Sector Report 2019/2020). Following the trials of the study by Simatele (2015), who claimed that South Africa has a more concentrated banking industry with a C5 concentration ratio of more than 84 percent market share (Cheang, 2016), supporting the claims of Mishi, Sibanda, and Tsegaye (2016). These identified five largest commercial banks in this study include Nedbank, Standard Bank, Absa, First National Bank, and Capitec, which are locally controlled banks operating in South Africa (ADV Rating, 2020). The total assets of the banks referred to as dominant banks are presented in the pie charts below (Figure 3.1).

Figure 3.1 Percentage change in total banking sector assets over a two-year period



Source: (SARB, 2019)

These large five banks referred to in figure 3.1 above are dominant and collectively held 90.2 percent of the total banking sector as of March 2018 and increased by 0.3 percentage points to 90.5 percent (approximately 91 percent) as of March 2019 (SARB, 2019). The total assets for local branches of foreign banks were 5.9 percent in 2018 and decreased by 0.3 percentage points in 2019 to 5.6 percent. The total assets of other banks were 3.9 percent in 2018, decreased by 0.1 percentage point to 3.8 in 2019. From figure 3.1 above, it evidences that from 2018 to 2019, only five largest banks had an increase of 0.3 percentage point. Whilst the other banks have experienced a decrease in the total asset.

Table 3.1: Total Assets of the Top Five large Banks in 2019

Rank No.1	Bank Name	Total Assets Rm
1.	Standard Bank Ltd	1,836,652
2.	First Rand Ltd	1,291404
3.	Absa Group Ltd	1,159,825
4.	Nedbank group Ltd	1,068,310
5.	Capitec	100,428

Source: Author's construct using Banks' Financial Statements (2019)

Table 3.1 above gives an indication of totals asset ownership by each of the five dominant banks in the South African banking sector listed in a hierarchy order, starting from the bank with major total assets down to the bank with the least total assets amongst the five dominant banks.

The influence on the sample size was the availability of equivalent South African bank's data on the variables. The banks included in the sample are commercial banks, which account for two-thirds of the value of the total assets of the banks in the population. The co-operative banks, Islamic banks, savings banks, investment banks, and real estate and mortgage banks make the remaining one-third of the total assets. Various filters were employed to maintain only the use of important and most relevant variables towards the banking sector when evaluating the relationship between. As part of the filtering process, the study only included banks that are relevant and excluded banks that utilize funds on loans and those banks that fund their activities through deposits to enable the exclusion of all banks that are below 91 percent of total assets from the study.

A precise contemplation was made to select bank-year observations to maintain and gain from the panel dimension of the data. The selected sample size was influenced by the availability of analogous data on variables of interest, yet other banks were short of 2006 to 2019 secondary gathered yearly data. Although, most banks had data available from 2006, which led to those years before being omitted from the sample. The period and sample size were influenced by the accessibility to comparable data for the variables of concern from various online sources such as Bank Scope, McGregor, the central bank of South Africa, World Bank database, Bank of International Settlements, and financial statement that was freely available from reliable online sources. The empirical methodology and sample size selection implemented in this study follow a similar criterion to that used in the studies by Simbanegavi *et al.* (2015) and Moyo (2018), which used a sample of 14 and 17 retail banks respectively to estimate the level of bank competition and its influence on financial stability.

The period of the study has been selected to commence from 2006 since the magnitude of the banking industry in South Africa has increased significantly over the preceding ten years (except for the period of the global financial crisis) which currently the magnitude of its contribution could be approximately three times more than the size of the economy. This period has best captured all growth of the banking sector in South Africa, particularly the big five commercial banks alluded to above. This growth influenced both monetary policy and financial stability (International Monetary Fund, 2011). The year 2020 was omitted due to the COVID-19 pandemic shocks that led to the delayed publication of various information, including but not limited to the release of financial statements for South African commercial banks.

Also, the challenge with the lack of data availability prohibited the construction of an appropriate effect of adjustments in competition measures and enough banks to include in the sample.

3.4 Data Source, Model Specification, and Description of Variables

Towards achieving study objectives which are to analyse the relationship between bank competition and financial stability, bank-level data has been used. The data was gathered from numerous sources such as Bank Scope, McGregor, the central bank of South Africa, World bank database provided by International Bank Credit Analysis Ltd, Bank of International Settlements, and financial statement that were freely available from reliable online sources. The data included a mixture of unconsolidated and consolidated yearly data from 2006 to 2019. The choice for the period used in this study depended on the varying cross-sectional structural

measures of bank competition, namely, Panzar-Rosse, Lerner index, and Boone indicator models, as well as the non-structural measure (concentration) chosen and the robust author's judgment that a 13-year period provided material time for predicting the link between bank competition and financial stability in South Africa.

3.4.1 Data Source

The study used yearly bank-level financial data from 2006 to 2019 from various sources alluded to in the above subsection and employed secondary data. The information on group Statements of Comprehensive Income, showing the performance of the bank and the Statements of Financial Position of different South African commercial banks, showing the financial position are used to obtain data that was used to calculate values for the variables used in the study models. Even the financial statements of some banks for the period ending 2020 were not yet available during the computation of the study and were further characterized by abrupt shocks on the bank system due to COVID 19 pandemic.

Some information on the financial statements from Capitec was not available on the bank's website. Therefore, the estimated figures, such as 2014 and 2015, were derived using simple interpolation from two (2) years before and two (2) years after the years stated above. Thereafter the heteroscedasticity test was tested to minimize chances of type 1 error.

3.4.2 Model Specification

This study tested the correlation between bank competition and financial stability using the simple Competition/stability model that was utilized by scholars such as Martinez and Repullo (2008), who investigated the correlation between financial stability and the form of competition, including, but not limited to, concentration. They found that there is a nonlinear relationship between bank stability and bank structure (Martinez and Repullo, 2008). The model of this study is composed of, firstly, financial stability as the dependent variable, measured by Z-score and profitability indices. Secondly, bank competition as the independent variable, measured by Boone index, H stats, and Lerner index (Martinez and Repullo, 2008). Lastly, Economic activity and bank size as control variables (Martinez and Repullo, 2008). The specified equation for the model for this study took the form presented below.

$$Financial\ Stability_{i,t} = \beta Comp_{i,t} + \Theta Y_{i,t} + \Phi X_{i,t} + \varepsilon_{i,t} \quad \ldots (1)$$

Where, $Stability_{i,t}$ measured bank stability of bank i at time t, $Comp_{i,t}$ measured the level of banking industry-wide competition and $Y_{i,t}$ represented macroeconomic controls and $X_{i,t}$ are the vectors of bank-level ratios. The fixed bank's effect $\mu_t \; and \; \varepsilon_{i,t}$ to monitor the bank's indeterminable characteristics over the years, as well as the random error with normal distribution. The financial stability of the bank can be specified using innumerable dependent variables, although this study has used two indicators of financial stability and three different direct proxies for bank competition with one non-structural measure, control variable, and vectors. Each variable was tested for robustness, as expanded and alluded to below in the substitute specification subsection.

3.4.3 Substitute Specification

It is essential for each study to check for robustness, particularly when there are different models available to measure the variables. For instance, in this study, bank competition is measured by three direct or structural measures, namely, Lerner index, Boone index, and H-statistic, and one non-structural measure, namely, concentration. Financial stability is measured by two indicators, namely, Z-score and profitability. A robustness check provides surety on the validity or support of the results obtained. In other words, it serves to verify the analysis. i.e., checks how the empirical conclusions on the results had varied when the assumption changed.

To test for robustness, this study specified the substitute that uses the short version of the revenue equation that included ratios like total revenue to total assets as dependent variables. The total revenue was calculated as the total interest revenue plus other operating revenues such as contract income and fee income.

3.4.4 Description of Variable's Measures

The bank competition in this study was measured firstly, through the Lerner index (LI), H-statistics (H-stats), and Boone indicator (BI) since it followed the trails of Martinez and Repullo (2008), then concentration proxied by concentration ratios (CR) and Herfindahl-Hirschman Index (HHI) proposed supported by Ifeacho and Ngalawa (2014). Lastly, financial stability was measured using Z-score and profitability used by Ho and Saunders (1981); Allen (1998); Huiredza (2000); Goddard *et al.*, (2004). Profitability was proxied for by return on assets (ROA). The above referred to ratios were applied by many scholars such as Mirzaei *et al.* (2011); Ifeacho and Ngalawa (2014); Petria *et al.* (2015), Mokatsanyane (2016). Although, the ROA proved to be the best, drawing from the empirical findings of other similar studies,

including, but not limited to, the studies by Ifeacho and Ngalawa (2014); Martinez and Repullo (2008). The clear description of these variables is abridged in Table 3.2.

Table 3.2: Summary of Variables Description

VARIABLES	DESCRIPTION	EXPLANATION
1. INDEPENDENT/EXPLANATORY VARIABLES		
Bank Competition Measurements		
H-statistic	H-Stats	Measure the elasticity of a bank's revenues relative to input prices (Rosse and Panzar, 1977).
Lerner Index	LI	Measures the percentage mark-up that a firm can charge over its marginal cost (Lerner, 1934).
Boone Indicator	BI	A measure of the degree of competition, calculated as the elasticity of profits to marginal costs (Boone, 2001).
Concentration:		
Concentration Ratio	CR	Measures the market share of the dominant banks in the system in terms of assets (IMF 2004).
Hirschfield-Herfindahl Index	HHI	A measure of market concentration and is used to determine market competitiveness, often pre- and post- M and A transactions (Bikker and Haaf 2002).
2. DEPENDENT VARIABLES		
Bank Stability		
Z-score	Z-score	Captures the probability of default of a country's banking system and compares the buffer of a country's banking system with the instability of those returns. (Boyd et al., 2006)
Profitability[3]	ROA	A measure of how much profit a business is generating from its capital (Guru, 1999).
3. CONTROL VARIABLES		
Macroeconomic Variables	GDP	An expansion in either (i) per capita GDP or overall production (Ramey, 1995).
	Bank Size	Bank-specific variable for asset ownership, calculated as the logarithm of overall Assets (Misky and Kindleberger, 1978).

Source: Computed by the author (2021)

[3] The banking sector rely on debt and the ROA which includes both Equity and debt is more relevant for banking industry. Hence this study only used the ROA instead of the ROE.

This study utilised two momentous key independent variables, namely, bank competition and concentration. Table 3.2 above highlights the definition and classified the variables and their role in measurement that are used to perform regressions and other verification measures such as robustness checks. The variables were classified into three categories noting that the variables category in the first category is dependent in nature. The second category included variables that are independent or explanatory in nature. Lastly, the control variables, which control for the relevant variables which are not observable in the model depicting the effect of bank competition on financial stability. For instance, the aggregate demand for bank services indicated in the economic activity. The dependent variables depend on the independent variables to change, as noted in the study by Martinez and Repullo (2008). In short, the regressions and descriptive statistics presented the outcomes of this study on the basis that the model depended on the three variables, such as those that are dependent in nature, independent while controlling for the other relevant variables.

3.5 Description of Bank Competition and Financial Stability Measures

The first variables measured bank competition included H-statistic, Lerner index, the Boone indicator, and concentration (which was separately proxied by the concentration ratios and Herfindahl-Hirschman index (HHI), Bikker *et al.* (2012); Samad (2012); Anginer *et al.* (2014); Leon (2015) in their studies that invested effect of bank competition on financial stability (Martinez and Repullo, 2008). Different control variables, namely bank size, and GDP for bank-specific factors and macroeconomic.

This study was formulated after various other studies that took over abroad and few from local, which investigated the degree of competition using different measures in the banking sectors. The regressions included banks μ_i as static effects to all regulation of defined bank characteristics in the period, and ε_i was a random error containing a normal distribution.

3.5.1 Panzar-Rosse Approach (H-Statistic)

Amongst the four measures of bank competition (both structural and non-structural), that is used in this study is the H-statistic which is produced by the Panzar-Rosse (PR) model. The Panzar-Rosse (P-R) H-statistic model, which measured the correlation that exists between bank competition and financial stability. This study used Panzar-Rosse (P-R) Model was popularised by Rosse and Panzar (1977; 1987), which is based on a reduced revenue form or price equation. The P-R model is also a time-varying methodology generally used to represent a bank's

revenue function with the price of the bank production factors as an explanatory variable (Bikker, Shaffer, and Spierdijk, 2009). In other similar studies, such as the one by Arrawatia, Misra, Dawar, and Maitra (2019), price function is estimated other than the revenue function, where a dependent variable is a total revenue over total assets. In this study, the revenue equation was used instead of a price function following the trials of Shaffer and Spierdijk (2013) since it requires the linear regression model and only a limited number of observations.

Further, the bank-specific control variables were used to cater to different banks that earn large revenues in ways that are not linked to variations in input prices. The Panzar-Rosse (P-R) approach sums three regression coefficients in the measurement of the bank revenue on three inputs of the bank's production process (Rosse and Panzar, 1977; 1987). A reliable P-R model is defined by the inclusion of more control variables other than the input prices (Rosse and Panzar, 1977; 1987). These control variables simply refer to Bank Specific Factors (BSF), such as bank risk, bank size, and bank capital structure. Bank's total asset describes the BSF utilised to show a bank's economic scales. Most researchers agree that the size of a bank highly influences its income (Barbosa *et al.,* 2015).

The second variable of the revenue equation specifies the percentage change of total equity and total assets. Shaffer (2004) noted that capital ratios have a major effect on a bank's risk-taking and bank's profitability. The structure of bank funding shown within the quantitative relation of total debts to total assets would not make a bank profitable (Bikker, Shaefer, and Spierdijk, 2009). A higher level of bank loans in bank funding results in a bank seeking for more risk to raise profit, yet this also exacerbates the bank's risk level (Bikker, Shaefer, and Spierdijk, 2009). To monitor for the degree of the bank's risk in revenues, the liquidity ratio is used, which is released from the bank's cash, total cash, to total deposits. The final variable of revenue is given by the bank's share of other income to its total income (Bikker, Shaefer, and Spierdijk, 2012). The percentage point of other income to total revenue specifies the bank's potential to manage link issues of risk revenue (Bikker, Shaefer, and Spierdijk, 2012).

The P-R model used in this study assumes three inputs into production, namely labour, deposits, and infrastructure. The model produces a competition degree popular as the H-statistic. The H-statistics is a quantitative measure of the intra-banking sector competition level (Rosse and Panzar, 1977; 1987). An H-statistic produced by the P-R bank competition model further demonstrates the summary of elasticity or rate change of total revenue over changes in

input prices (Rosse and Panzar, 1977; 1987). For instance, from the revenue earned by all banks, it can determine how much a change in inputs has contributed on average. The H-statistics varies between 0 and 1 and can be interpreted as follows: Firstly, when H ≤ 0, the degree of competition that exists defines the bank as a Monopoly or Cartel (Rosse and Panzar, 1977; 1987). Secondly, when 0 < H < 1 Monopolistic Competition; H = 1 denotes Perfect Competition in the long run (Leon, 2015; Rosse and Panzar, 1977; 1987). The P-R in the banking literature is used to indicate the level of dominance (Rosse and Panzar, 1977) and its effects on financial stability. The null hypothesis is that the bank is a monopolist and rejected if 0 < H.

Since the H-statistic requires elasticities, the adjusted log-linear revenue from the equation called a variation of the Panzar and Rosse methodology presented below was used (Rosse and Panzar, 1987):

$$lnR_{i,t} = \beta + \lambda_1 lnAFR_{1,it} + \lambda_2 lnEA_{2.it} + \lambda_3 lnLO_{3,it} + \delta_1 lnCAD_{i,t} + \delta_2 lnAOTA_{1,it} + \delta_3 lnTA_{3,it} + \varepsilon_{i,t} \quad \ldots(2)$$

Where subscript i signified single bank, and the subscript t denotes the year in which a bank operated. Empirical banking literature often takes interest income as revenues to capture only the intermediation activities of banks (e.g., Bikker and Haaf, 2002). $lnR_{i,t}$ representing the logarithm of the bank's annual revenue, $AFR_{1,it}$ represented the total expenses to total deposits ratio, $EA_{2,it}$ was the total equity to total assets ratio, $LO_{3,it}$ was a ratio of the new loan to the overall loan ratio. The model is similar to that utilised by other scholars in the literature by Bikker, Shaffer, and Spierdijk (2009) to predict H-statistic for banking industries of other countries. The study involves various essential control variables at the bank level. $CAD_{i,t}$ represented the ratio of total cash to total deposits. $AOTA_{2,it}$ shows the ratio of individual personnel expense to total assets. $lnTA_{3,it}$ represented the logarithm of total assets of a bank (Rosse and Panzar, 1977; 1987). The natural logarithms of all variables are accommodated. All the control variables accounted for the differences in risks, costs, and structure of the individual banks.

The first model was predicted using both ordinary least squares (OLS) containing time dummies and general least squares (GLS) containing constant bank-specific influence in order

to capture unscaled revenue equation, which was applied by researchers such as Amemiya (1985) and Greene (2000). Bikker *et al.* (2009) claimed that only the unscaled revenue function produces an effective measure for competitive conduct. Lastly, β denoted bank-level fixed effects, then the $H - statistic = \lambda_1 + \lambda_2 + \lambda_3$. The next step referred to H1 as the H-stats computed using the OLS and refer to H2 as the H-stats predicted using GLS with fixed-bank impacts. This helps determine the closeness of uncontrolled estimations in relation to monitor the null hypothesis. A Wald test stipulates the type of competition that exists. For instance, monopoly/oligopoly, when $\lambda_1 + \lambda_2 + \lambda_3$=0 conversely when $\lambda_1 + \lambda_2 + \lambda_3$ =1, represents monopolistic or more than one; it represents perfect competition. This was necessary to determine whether bank competition has positive or negative impacts on financial stability. Large values of the H-statistic are related to more competitive banking systems and enhance the financial stability of developed banks and deteriorate that of less developed banks.

3.5.2 Lerner Index measure of bank competition

Amongst the measures of bank competition used in this study, there is another model, which is called the Lerner index. The Lerner index represents market power measured by charge price over marginal cost (MC) (Rojas, 2010). In simple terms, the Lerner index measured a bank's ability to charge prices above MC for each transaction entered into with a client (Rojas, 2010). Hence, it is defined as the difference between MC related to prices and banking output prices as proposed by Casu and Girardone (2009). This means that it reflected banking capacity to keep its prices always above MC (Berger *et al.*, 2009). Observed from the limited information relating to the prices of banks, this study used price elasticity in the computation of the Lerner index. A study by Arrawatia, Misra, Dawar, and Maitra (2019) used the Lerner index to provide stylized facts on competitive levels of banks in South Africa over time. The MC is the first difference of the total cost function as derived from the trans-log of the cost function (Berger *et al.*, 2009). The assumption under perfect competition is that the price charged by a bank must equal the MC, and thus, that bank will have no market power (Berger *et al.*, 2009). Then, with respect to the Lerner index, the normal period of the individual bank that was part of the regression model was utilised. The Lerner index equation was computed as:

$$Lerner_{\ i,t} = (P_{i,t} - MC_{i,t})/P_{i,t} \quad \ldots (3)$$

The subscript i and t denotes bank i and year t, respectively. Given that $P_{\ i,\ t}$ reflects the ratio for price of total revenue (both interest and non-interest income) to total assets for bank i at

time t, the $MC_{i,t}$ proxied further unit cost of overall assets for bank i at time t. In a perfectly competitive system, the price charged by the bank for its services must equal to its MC (Fernandez de Guevara *et al.*, 2005), and thus, that bank will have no market power as claimed by various researchers such as Fernandez de Guevara *et al.*, (2005); Berger *et al.*, (2009); DemirgucKunt and Peria, (2010); Fungáčová *et al.*, (2010). The Lerner index ranges between 0 and 1 (Ariss, 2010). When it is near to 0, that indicates perfect competition (Ariss, 2010). When it is near to 1, that reflects greater market power the bank has and thus indicates a monopoly (Pruteanu-Podpiera *et al.*, 2007; Ariss, 2010). A bank that wants to maximise profits should not utilize the inelastic side of the demand curve. For instance, where elasticity is less than one (E < 1), thus elasticity is surely $\infty \geq E \geq 1$ (DemirgucKunt and Peria, 2010). Thus, the Lerner index measure competition at the bank level.

The $MC_{i,t}$ that was used to calculate the Lerner index was derived with respect to total assets as indicated in the following trans log total cost function:

$$lnCost_{i,t} = \propto_{0,i} + \beta_1 lnY_{i,t} + \frac{\beta_2}{2} lnY_{it}^2 + \sum_{k=1}^{3} \gamma_{kt}\, lnX_{k,it} + [\sum_{k=1}^{3} \emptyset_k lnX_{k,it} * lnY_{k,it}] + \left[\sum_{k=1}^{3}\sum_{j=}^{3} lnX_{k,it} ln * X_{j,it}\right] + \varepsilon_{it}\Big] \quad \ldots (4)$$

Following a study by Fernandez de Guevara *et al.* (2005); Shaffer (2003), Cost depicted the total operating and financial costs for bank i in time t. $Y_{i,t}$ represented bank productivity or bank i at time t, and $X_{1,it}$, $X_{2,it}$ and $X_{3,it}$, respectively signified the input factors such as input prices of labour (interest expense/ total deposits), funds (Personnel expenses /total assets), and fixed physical capital costs (Other operating and administrative expenses/ total assets) (Carlo *et al.*, 2009). When computing the MC[4], the study used the Total cost (TC)[5] computed using the equation above, which was found in the statement of comprehensive income. The deposits have been excluded, and only external funding (long-term debts and subordinates' debts) remain.

[4] Schaeck and Cihak (2010) approximate a firm's marginal costs by the ratio of average variable costs to total income.

[5] Total costs are the sum of personnel expenses, other non-interest expenses, and interest expenses.

It was using the assumption that the slope of the cost function in the South African banking sector is constant through time t (DemirgucKunt and Peria, 2010). This study calculated the MC for overall banks by estimating the trans-logarithmic cost's function regression over the data range. It is further relying on the amount of production, total assets, and technical change, which is proxied by a Trend.

MC[6] has been predicted based on a trans-log cost function with one output (total assets) and three input prices (price of labour, price of physical capital, and price of borrowed funds). Symmetry and linear homogeneity restrictions in input prices are imposed (Iveta, 2012). The MC $_{i,\,t}$ is then calculated as:

$$MC_{it} = \frac{TC_{it}}{Y_{it}} = [\beta_1 + \beta_2 lnY_{it} + \sum_{k=1}^{3} \emptyset_k lnX_{k,it}] * [\frac{C_{it}}{Total\ Assets}] \quad \ldots (5)$$

The above equation implied that variations $Y_{it}\ and\ X_{1,it}, X_{2,it}, X_{3,it}$, and C_{it} Leads to variations in bank-level Lerner for South Africa. Total income and non-interest income in the study are used as the main sources of revenue in model five (5) above, and predictions are performed through standard pooled ordinary least squares regression.

3.5.3 Boone Indicator

The third measure of the level of competition in this study was the Boone indicator (Boone, 2001; 2008), computed flexibility of turnover to marginal costs (World Bank, 2020). To determine the degree of elasticity, the study regressed the log of profits (indicated by return on assets) on the marginal costs (Schaeck and Čihák, 2010). The estimated coefficient (resulting from deriving a trans-log cost function) proxy for elasticity (Boone, 2008). The general principle is that more efficient banks have the potential to generate large turnover (The World Bank, 2020).

The Boone indicator possesses a strong theoretical basis, based on the assumptions of limited entry barriers and the hostility of banks in the sector (Boone, 2008). The model reflects the effect of competition on performance based on profits and market shares (Boone, 2008). The

[6] Note for Capitec: for years where the interest expense was not provided or could not be reasonably be calculated, the average interest rate that is consistent with the amount of borrowed funds was used. Also, there were borrowed funds for the first four years of our data set, thus their cost of borrowed funds are zeros.

existence of more competing firms with less marginal costs (MC) results in higher turnover or shares, meaning the higher level of competition in the banking sector results in a massive impact on financial stability and leads to massive negative indicator (Hay and Liu, 1997; Boone, 2001; Boone, Griffith, and Harrison, 2005). This shows that an increase in competition works to the advantage of the firms that are efficient and worsens the firms which are inefficient (Boone, 2001 and 2008).

Using the Boone indicator has various benefits, such as firstly, the ability to assume that products are close substitutes (Boone, 2001). This gives Boone indicator an advantage over concentration measures and most other competition measures (Hay and Liu, 1997). The other advantage of using the Boone Indicator captures competition for various definite product markets and diverse categories of financial institutions (Schaeck and Čihák, 2010). Thirdly, conventional measures such as H-statistics and Lerner Index may produce results characterized by a fundamental weakness, particularly due to interest rate regulations applicable to the commercial banking sector (Boone, 2000). Lastly, Boone Indicator is capable of measuring the commercial banking industry only, while other measures measure the overall banking sector (Boone, 2000). The Boone indicator model enables yearly estimates of bank competition, allowing evaluation of historical evolution of competition (Hay and Liu, 1997; Boone, 2001; Boone, Griffith and Harrison, 2005). The Boone indicator is calculated using bank-by-bank data as claimed by Schaeck and Čihák (2010), available from online financial statements and Bankscope. Using trails of Schaeck and Cihak (2010), the following model for Boone indicator was also used to measure bank competition:

$$\ln(\pi_{i,t}) = \alpha + \beta \ln(MC_{i,t}) + \varepsilon_i \quad \ldots (6)$$

Where: $\pi_{i,t}$ represented profit of each bank over time. The study used return on assets (ROA) as the proxy for proceeds following Leuvensteijn *et al.* (2011)[7], and $MC_{i,t}$ (Measured the same way as the Lerner index model in the previous sub section) reflected the marginal cost incurred by each bank over time. β denoted the Boone indicator and ε_i represented the error term. The model above measured the competitive conditions for each of the sampled commercial banks in South Africa that is part of the data set over the period of 10 years covered by the sample. It

[7] The dependent variable is computed as log (1+ROAit) to avoid negative values of return on assets in the log specification.

is expected that banks with low marginal costs make higher profits, for instance, $\beta < 0$. More competitions tend to expand this effect since banks that are more efficient performs more than inefficient banks (Griffith and Harrison, 2005). The positive values of β indicate higher levels of marginal costs of the bank, and the more profit it will earn (Leuvensteijn *et al.,* 2011) and signal the existence of a high degree of collusion or competition on quality (Tabak *et al.,* 2012).

3.6. Measures of Bank Concentration and Financial Stability

The final measure of bank competition used in this study is concentration. This measure is mostly relevant when evaluating the degree of contestability since the other three measures, namely, Lerner Index, Boone Indicator, and H-stats, in isolation, are not sufficient indicators of contestability, considering the findings of Leon (2015); Anginer *et al.* (2014); Bikker *et al.* (2012); Samad (2012) that marked it as insufficient to conclude that high level of concentration means the absence of competition (Bikker and Spierdijk, 2008). The banking sector is characterised by a few dominant banks (Cetorelli, Hirtle, Morgan, Peristiani, and Santos, 2007). Given that the South African commercial banking sector is concentrated (IMF, 2004; 2013), it is necessary to include a concentration in the analysis of this study. The level of concentration is determined by calculating the market share (market capitalisation) over the total market capitalization of the overall banking industry, which allows detection of banking sector domination by few large banks (Samad, 2012).

Of the different ratios that were discussed in the literature, including k bank Concentration Ratio (k-CR); the Herfindahl-Hirschman Index (HHI); the Hall-Tideman Index (HTI); the Rosenbluth Index (RI); the Comprehensive Industrial Concentration Index (CCI); the Hannah and Kay Index (HKI); the U Index (U); the multiplicative Hause Index (Hm); the additive Hause Index (Ha); and the Entropy measure (E), the study only expanded on the rationale behind concentration ratios and HHI (Bikker and Haaf 2002). The use of two measures was further supported by the IMF (2013) as the comprehensive measures of concentration.

3.6.1 Concentration Ratios

The concentration ratio signified the proportion of revenues or earnings of the five dominant large banks in South Africa (Beck *et al.,* 2009), when CR 5 is applied or three dominating banks CR 3, as theoretically discussed in the literature by Bikker and Spierdijk (2008), chapter 2 of this study.

In the case of the South African banking sector, there is a concentration ratio of more than 84 percent of market share, and this industry qualifies as a CR 5 and banks owning more than 90 percent of total assets (Beck *et al.,* 2009). Amongst the five dominant commercial banks in the South African banking sector sampled, the study used the top three to calculate the CR3, following the example of D'Arista (2009), who observed that in the United States, the top 10 banks accounted for 26 percent of total assets in 1984, but in 2008, five banks were controlling 97 percent of the total assets (Mugano and Le Roux, 2017). Hence, the South African banking sector is concentrated. Concentration ratios are calculated using the following formula:

$$CR = \sum_{i=0}^{n} s^2{}_{i,t} \quad \ldots (7)$$

Where CR is the concentration ratio, s_i represented each bank's market share, *n* represented the number of banks operating in a season (Bikker and Spierdijk, 2008). The market portion of a bank was given by a ratio between the bank's total assets and total assets for the entire sector (Bikker dan Spierdijk, 2008). The concentration ratio varies between nearly 0 and 1 (Beck *et al.,* 2009).

This study used the CR 3 and CR 5 concentration ratios indicating banking sector domination by three and five largest banks, respectively. The situation of the South African banking sector is best suited by the CR 5 since it is dominated by five large banks meeting the specified requirements as per the South African Reserve Bank (SARB) rules and regulations. There are hazards affiliated with the use of the concentration ratio since at times may lead to incorrect conclusions, as a result of it being only limited to market share measure of only three or five largest banks and ignores any other existing banks in the sector.

3.6.2 Herfindahl-Hirschman Index

Amongst the different indices that can be used to proxy for bank concentration, the Herfindahl-Hirschman Index (HHI) is one of the most highly used measures of concentration as per the theoretical literature and mostly serves as a framework for other indicators (Bikker and Haaf, 2002). Bikker and Haaf (2000) defined Herfindahl-Hirschman Index (HHI) as the sum of the squares for bank sizes estimated as market shares. This measure was trailed by the inventor of concentration ratios as one of the concentration measures to be used in the banking sector (DemirgüçKunt and Levine, 2000) and a universally recognized tool for measuring market concentration (IMF, 2013). It is estimated as follows:

$$HHI = \sum_{k=1}^{N} \left(\frac{s_{i,t}}{S}\right)^2, \qquad 10\,000 \geq HHI \geq 0 \qquad \ldots (8)$$

The variable $(s_{i,t})^2$ is the square for a market share of output for the bank to the output of the banking sector in each given season, and k equals the banking unit, S is the aggregated size of all the bank assets in the region (South Africa in this case), N represents the number of banks in the banking sector (Bara, Mugano and Le Roux). The HHI value may range from 0 to 10 000, which also determines the type of competition that exists in the banking sector (Bara, Mugano, and Le Roux). For example, in a banking sector where HHI=1/N, the banking sector less concentrated, and each bank has an equal market share. When the industry is a monopolist, it HHI $= 100^2$ = 10,000, in contrast, where each bank owns 1 percent market share the resulting $HHI = 1^2 * 100 = 100$, representing a highly competitive market.

The concentration using HHI has three criteria as suggested by the literature. The first criteria generally accepted that, when HHI = 1000 or above, the banking system is highly concentrated (Mishi and Tsegaye, 2012). The second criteria propose that the HHI values ranging from 1000 to 1800 indicate a discreetly concentrated market, the HHI value beyond 1800 suggests the existence of a high level of banks concentration, and the mean is most near that, HHI values that are less than 1000 indicate a non-concentrated market (Mishi and Tsegaye, 2012). Lastly, the HHI values that are over 1800 suggest a significantly concentrated market (Mishi and Tsegaye, 2012).

3.7 Description of Measures for Financial Stability

The Bank stability is amongst the material aims this study that seeks to investigate, hence a variable depending on other variables (independent) to vary. This study used two dependent variables in the model, including the Z-score as the first dependent variable to measure financial stability. The second dependent variable is profitability, which was used to proxy the bank's financial stability. The profitability in this study proxied by the return on asset (ROA).

3.7.1 Z-score as a Measure of Financial Stability

The use of various dependent variables to proxy for banks financial stability in this study, such as the Z-score and profitability, allowed the estimates to properly gauge the link between bank competition and financial stability through the assessment of panel data models, dependent variable using two measures of bank stability (Z-sore and profitability).

Z-score is the measurement of banks' overall financial stability and risk as depicted in literature by scholars such as Cihak and Hesse (2008). It is an accounting-based risk and stability measure capable of predicting the distance from the insolvency of the bank (an inverse proxy for risk) **(**Boyd *et al.,* 2006**)**. The Z-score has been discussed in the literature of Cihak and Hesse (2008), as a tool to assess the impact of bank competition on financial stability, for instance, the literature of Boyd *et al.* (2006); Schaeck and, (2014); Ijtsma *et al.* (2017); Cummins *et al.,* 2017). The Z-score is calculated as:

$$Z_{i,t} = (ROA_{i,t} + \frac{E_{i,t}}{A_{i,t}})/\sigma ROA_{i,t} \quad \ldots (9)$$

Where, $ROA_{i,t}$ proxied the bank's return on assets (ROA). The ROA indicates how profitable a bank is and reflects on its management converting assets into more assets (Boyd *et al.,* 2006). Mostly this term is addressed as return on investments (ROI) as proposed by Ahern (2017), $\frac{E_{i,t}}{A_{i,t}}$ Is the equity to assets ratio of bank i at time t. It specifically measures the amount of equity the bank has when related to the total assets of the bank (solvency) (Ahern, 2017), although the $\sigma ROA_{i,t}$ represented the standard deviation of return on assets calculated over a rolling period (Schaeck and Cihak, 2008). The larger the value of the Z-score indicates the strength the bank is, and vice versa (Schaeck and Cihak, 2008).

Finally, the quantile regression was also used to analyze if the health status of the bank does influence the link between bank competition and financial stability (that is measured by the Z-scores), risk-adjusted returns, and risk-adjusted capitalization (Boyd and De Nicolo, 2005). Also, a greater value of Z-score means the bank is taking a lower risk (Boyd and De Nicolo, 2005). The mean of the Z-score calculated is always 0, and the standard deviation (or variance) is always increasing by 1 unit (Boyd *et al.,* 2006).

3.7.2 Bank Profitability and Financial Stability Measures

The second financial stability measure is profitability. The bank's profitability can be estimated using the three most common ratios, namely return on equity (ROE), return on asset (ROA), and bank size (Fargo, 2015). Although, there are other measures including, but not limited to, the net interest margin (NIM). The value of the ROA is calculated in the same pattern as that used in the Z-score calculation in the previous subsection above. According to Fargo (2015), when assessing how the bank makes a profit and how it uses the assets, it is important, but not

efficient, to consider the earnings per share instead. Different ratios may be included, namely, the ROA, ROE. However, due to the objectives of this study, only the ROA was be expanded on and used to proxy profitability as a measure for financial stability since it is fundamental to investors when making an assessment. Further, the banking sector relies on debt and the ROA (which includes both Equity and debt); thus, it is more relevant for the banking industry.

3.7.2.1 Return on Assets and Profitability

The return on assets (ROA), also known as the return on total assets, is a form of return on investment (ROI) metric that proxy for the profitability of the bank (Guru, 1999). The ROA is a commonly used proxy for a bank's profitability (which is a measure of the bank's stability). Estimating the ROA portrays the bank's capability to make a profit and asset usage (Guru, 1999). This ratio profitability measure provides the percentage changes in turnover that are accumulated using assets (Bank rate, 2020). This rate change assists the investor in determining how efficiently the bank makes a profit from its capital (Bank rate, 2020). To calculate the bank's ROA, the information about net income and total assets is used, which can be obtained from the statement of comprehensive income (SOCI). It is given by the ratio of disposal earnings/ income to total assets (Cooperate finance Institute, 2020). Therefore, the formula to calculate the ROA is given by:

ROA = [(Disposable income)/ (Total Assets)] *100 ... (10)

A large rate of ROA indicates that a bank is using its assets efficiently (typically a bank that is less asset-light) (Guru, 1999). For instance, a ROA ratio of 1 percent represents the good performance of the bank since a lower return on assets indicates a bank that is more asset-intensive. The general rule of thumb, any return on assets below 5 percent is regarded as an asset-intensive bank (Guru, 1999). In contrast, a return on assets beyond 20 percent is regarded as an asset-light business (Cooperate Finance Institute, 2020).

The formulas provided above are more convenient and easier to use than those used to calculate return on investment (ROI). The distinct between ROA and ROI that ROA is the bank's internal measure or rather a view on the investment made in another bank. On the other hand, the ROI is mainly used by external investors.

3.8 Description and Measure of Control Variables

The control variables are those which the researcher can control for when tiring want to achieve a certain objective of the research (Aggarwal and Jacques, 2001). The control variables are adopted to evaluate the relationship between bank competition and financial stability in this study are the bank size and economic activity (represented by the GDP of South Africa).

3.8.1 Economic activity Gross Domestic Product (GDP)

The gross domestic product (GDP) of a country denotes the total value of goods and services manufactured in the country, South Africa in this case, in a certain period. According to Booyens, Nayagar, and le Roux (2018), GDP was noted by Simatele (2015) as a tool that measures economic performance (Mohr, 2011) by aggregating the monetary value for all services provided by each bank in South Africa in a certain period minus the value of the services produced at the end of given time (Bankrate, 2020). GDP growth shows the potential of the economy to create wealth and its risk of overheating (Gadanecz and Jayaram, 2019). In South Africa, the banking sector contributes above 20 percent towards the gross domestic product (GDP), and the banking sector contributed over 10 percent of overall employment in the country (Booysens, Nayagar, and Roux, 2018). Financial stability is considered an important driver of GDP growth in subsequent quarters, as claimed by Jokipi (2010) since the GDP measures the value of economic activity within a country in a particular period (Ramey, 1995; Fat´as and Mihov, 2003). This shows the potential of GDP to proxy bank-specific factors or control variables for a bank's financial stability. This evidence in the findings of the studies by Monnin and Jokipii (2010); Harvey, Abor, Adjasi, and Manu (2011), which investigated the link between the banking sector and GDP output growth and found that shocks are more persistent in their effect on banking stability more than on GDP growth. There is still uncertainty about future GDP growth, whether it is smaller in booms than in recessions.

The data of the GDP (at year-end) that is used to measure the level of economic growth was compiled from the Statistics South Africa for the period 2006 to 2019 (Hsueh *et al.*, 2019) and the Bank of International Settlements. The GDP variable has been expressed in South African current prices (Rands), which have been deflated using the overall retail price index calculated, with 2009 as the base year. When GDP exhibits negative or low positive values, that signals a slowdown in economic growth, hence negatively affects the financial stability of the banks. On

the other hand, excessively high values may show unsustainable growth (Gadanecz and Jayaram, 2019).

3.8.2 Bank size

The bank size is another bank-specific factor or control variable adopted in this study. To determine the impact of bank size on financial stability, the study uses simple regression on bank-level data to predict the stability-size relationship (Misky and Kindleberger, 1978). The model is developed where financial stability is a function of the size and characteristics of the market the bank operates in. Controlling for these characteristics, referred to as Bank-specific factors[8] and Market-specific factors, [9] allows measurement of the relationship between bank size and stability separately and eventual changes over time. The model was estimated using the logarithm of total assets, as done in the study by Aggarwal and Jacques (2001). The reason for the choice of bank size was the motivation from most other similar studies such as the ones by Al-Omar and AL-Mutairi, (2008; 2010); Masood and Ashraf (2012); Perera *et al.* (2013), which spotted bank size as an essential internal factor that directly impacts financial stability and supported in a preceding study by Mullineaux (1978) that revealed a positive impact of bank's size on stability. Various factors impacting the financial stability, namely, the geographic location of the bank, have been proven by Emery (1971); Vernon (1977) to contribute to stability.

There is an existing debate amongst the researchers on the issue of bank size rises as well as stability. This means that the effect of the bank size is not stable, rather causing economies of scale (Aggarwal and Jacques, 2001). The other group of researchers such as Kwast and Rose (1982); Heggested (1977), and Smirlock (1985) opposed and took a stand that as the size of the bank expands, the cost of embarking on a business also rises, causing diseconomies of scale (Kosmidou *et al.*, 2006), meaning that there is little impact of bank size on financial stability. Thus, there is no constant relationship between financial stability and bank size. It is either a positive or inverse relationship, and this evidence is supported in the preceding study by Hester and Zoellner (1966). Increasing a bank's asset size could eliminate the risk by diversifying operations across product lines, sectors, and regions, as claimed by Mester (2010), which increases the rate of profitability, causing financial stability to increase.

[8] Bank-specific factor refers to bank strategies reflected in the composition of banks' assets and liabilities.

[9] Market-specific factors refers to growth in the markets in which banks operate.

3.9 Robustness Test

In this subsection, the study shows that our results are robust to alternative regression specifications as well as alternative definitions of bank competition and systemic financial stability. Various studies, such as Halcoussis (2005) have applied concentration measures as a market share of the top 5 and top 3 banks in the given country as well as the HHI to evaluate the level of competition in the banking system of the country in question, South Africa in this case. Concentration is related to competition. However, lately, the literature emphasizes the distinction between these terms, which means that concentration alone does not reliably measure competition (Beck, Demirguc-Kunt, and Levine, 2006; Demirguc-Kunt and Martinez Peria, 2010). Hence another measure of concentration is used in this study, including HHI to proxy for banking concentration. All the control variables remain the same. Although concentration found using the concentration ratios are ratios or rather percentages, the results are consistent with those obtained using HHI.

3.10 Summary and Concluding Remarks

This chapter applied the theoretical and empirical that were reviewed and philosophical assumptions underlying the research methodology of bank competition in the banking sector for the period 2006 to 2019. Also, a discussion of the research design for this study was produced. The analysis used three common structural measures of bank competition, namely, H-statistic, the Lerner index, and the Boone indicator. These are the non-structural or direct measures of competition. The analysis further used concentration as a structural measure of bank competition. The bank-level of financial stability was also predicted by alternative proxies of stability such as the Z-score and profitability. This analysis is like that of Zigraiova and Havranek's (2016), popularly known as ZandH’s meta-analysis of the relationship between bank competition and financial stability. The chapter indicated the use the secondary bank-level data in the study that was publicly available from various online sources such as Bankscope, McGregor, Bank of International settlement, to name a few. The chapter further defined the research methodology, including the population, sample, as well as strategies used to ensure the ethical standards, reliability, and validity of the study.

The models discussed in the methodology section were essential towards achieving the objectives of the study. The first objective was to determine whether competition in South African banking results in more stable banks. The competition-stability hypothesis estimates a positive link between bank competition and stability. This study answers this question by

regression the bank competition measures against financial stability measures. The second objective was to determine the dynamics of bank competition and identifying the level of concentration in the South African banking sector to observe how these variables significantly influence bank stability. Both financial stability and competition measures are used to aggregate the results from the empirical literature to come up with an overall estimate of the effect of bank competition on stability. The third objective was to assess the causality of bank competition and the stability of the South African banking sector. The question is answered using bank-level data from the US for the period 2006-2019.

CHAPTER 4: RESULTS ANALYSIS AND DISCUSSION

4.1 Introduction

To complete this study properly, it was necessary to analyse the secondary data collected to test the hypothesis and respond to the research questions using the research objectives as a guide. As already indicated in the previous chapter, the data is interpreted in a descriptive form and graphical form. This chapter is detailing the analysis, presentation, and interpretation of the study results obtained using different methods. The aim of the presentation and discussion of results was to satisfy the study objectives, which were to analyse the relationship between competition and financial stability. The fixed panel trans-log functions were used as applied in other various similar studies such as Bandaranayake (2018).

This chapter is structured as follows: firstly, the presents and analyses of the results for the measures of bank competition, namely Boone indicator, the Lerner index, H-statistic, concentration ratio (CR), and the Herfindahl-Hirschman Index (HHI). Further, concentration ratios and the HHI results are presented and discussed as the poxy for concentration. Secondly, this subsection presents and discusses the financial stability findings based on financial stability measures such as the Z-score and profitability. Further, the return on assets (ROA) is estimated to proxy for profitability and analyzed results. After that, this chapter concludes with the summary of the effect of the independent variables on the dependent variables when the bank-specific factors are controlled.

4.2 Bank Competition and Financial Stability Results Analysis

This subsection presents and interprets the direct or structural measures of bank competition, namely the Boone indicator, Lerner index, and Panzar Rosse H-statistic and their relation towards financial stability in the South African banking sector. The Boone indicator, Lerner index, and the H-statistic includes regression analyses meaning that all these variables of bank competition are descriptive statistics.

4.2.1 The Boone Indicator results

One of the proxies of bank competition used in this study is the Boone indicator. In this subsection, the study proceeded with the estimation of the Boone (2008) indicator aimed to investigate the relationship amongst bank competition and financial stability as specified in equation number 6 in chapter 3 subsection 3.4.5.3, following the trails of Van Leuvensteijn *et*

al. (2011) and Mirza *et al.* (2016). The Boone Index table has been estimated using Stata. The Boone indicator can be manually computed using equation 6 from chapter 3 subsection 3.4.5.3. Due to the nature of the Boone indicator function being a log-log, the log (1+MC) is used in place of log (MC) as the core variable (Doll, 2010).

The coefficient for the profitability of all five South African dominant commercial banks from Table 4.1 is negative (market share for total assets), which is in line with the guidelines given by Backer (1973). This gives the impression that a high level of bank competition results in less profit (existence of an inverse relationship between bank competition and profitability as well as stability), hence support the competition fragility hypothesis as per the literature by Martinez-Miera and Repullo (2010), reviewed in chapter 2 subsection 2.2.11. The measure of interest, coefficient of marginal cost, is more negative for four banks, and for Standard Bank, it is positive but closer to zero. The β coefficient is -8.577 for Capitec, -0.302 for Absa, -5.766 for FNB, -4.141 for Nedbank, and 1.995 for Standard Bank when Boone indicator is used as a measure of market power. The coefficients of three banks, including Capitec, FNB, and Nedbank, are statistically significant at all levels below 0.1. Absa has a coefficient that is statistically insignificant, meaning it is as good as zeros. For standard banks, the coefficient is not statistically significant at all levels.

The minus sign on the coefficients suits the expectations of this study researcher as it suggests that the banks would obtain a lower market share when the bank competition increases. The more negative values of marginal costs indicate a low response by the bank in the presence of a high level of bank competition due to unstable output reallocation. From this observation, it can be concluded that the South African banking sector exhibits a high degree of bank competition except for the observations from two banks, namely Absa and Standard bank which are zero and positive, respectively, suggesting less market power, although the value of Standard bank is not highly positive. The observations of a lower degree of competition in the South African banking sector support a descriptive statistic in the empirical evidence by Boone *et al.* (2004) presented before in chapter 2 regarding a high degree of concentration. Therefore, the banking sector meets the definition of an oligopoly. In general, when bank competition is weak, the volatility of market shares rises, supporting the need for output reallocation.

The R-squared in Table 4.1 below is known as the coefficient of determination. For Capitec, FNB, and Standard bank, it is more than 50 suggesting the best fit of the model in estimating the South African banking sector Boone indicator. For Absa, R-squared is closer to zero,

meaning 0 indicated that the model explains almost none of the variability of the secondary data around its mean. For some fields of R-squared may be expected to be low, at least below 50 percent. In most cases, when using the time series data R-squared is expected to be high, as it is the case for Boone indicator in this study.

Table 4.1: Boone Index Regression Results

VARIABLES	lnCapProf	lnAbsaProf	lnFNBProf	lnNedProf	lnSbkProf
Coefficient	-8.577***	-0.302	-5.766***	-4.141**	1.995***
	(0.430)	(0.662)	(0.814)	(1.483)	(0.474)
Constant	2.521***	8.832***	6.738***	7.112***	10.53***
	(0.229)	(0.346)	(0.356)	(0.620)	(0.298)
R-squared	0.972	0.017	0.807	0.394	0.596

Source: Author's calculations using Stata

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1, denote statistically significant

4.2.2 The Lerner Index Empirical Results Analysis

The Lerner index is another measure of bank competition estimated to check the robustness of the results presented in Table 4.1. Just a recap, when determining the cost function constraints, the study predicted one trans-log cost function overtime period used by Loewald (2020) and not cross-section as done by Van Leuvensteijn *et al*. (2008), Weill (2013); Daglish *et al.* (2015). The purpose was to maintain the degrees of freedom since the panel sample is small. The lack of marginal cost values may suggest a risk of possible inaccuracy in the results when calculating the Lerner index. Thus, the solution to this problem was using average variable costs to represent marginal costs (Boone, 2008) and check robustness. The index ranges typically between 0 and 1 (Boone, 2008). When a firm is perfectly competitive, it charges a price equal to its marginal cost (P = MC), where the Lerner index equals zero (L = 0), such firm has no market power. The analysis of these results addressed research objective number two of this study by empirically proving that the SA's banking sector highly concentrated with the Lerner index closer to 1.

Table 4.2: Five South African Dominant Banks Lerner Index

Lerner Index for each bank					
Years	Absa Bank	Capitec Bank	Nedbank	First National Bank	Standard Bank
2006	0,938	0,409	0,950	0,941	0,932
2007	0,943	0,561	0,945	0,941	0,929
2008	0,951	0,581	0,959	0,946	0,926
2009	0,921	0,648	0,961	0,959	0,921
2010	0,928	0,753	0,961	0,948	0,934
2011	0,929	0,775	0,955	0,938	0,940
2012	0,921	0,794	0,951	0,939	0,931
2013	0,925	0,830	0,951	0,940	0,925
2014	0,925	0,836	0,949	0,935	0,929
2015	0,933	0,824	0,953	0,932	0,934
2016	0,925	0,817	0,948	0,933	0,931
2017	0,933	0,816	0,945	0,932	0,931
2018	0,939	0,813	0,948	0,934	0,949
2019	0,942	0,820	0,954	0,931	0,952
Mean	0,932	0,721	0,952	0,939	0,933
Median	0,931	0,804	0,951	0,939	0,931
Std Dev	0,009	0,127	0,005	0,007	0,008

Source: Author's Estimations (2021)

Table 4.2 above displays the results of the average of the Lerner index for each of the five dominant banks in South Africa over the study sample period (2006-2019) and the relevant median and the standard deviation. Noted from chapter 3, that the Lerner index represents market power measured by charge price over marginal cost (MC) (Rojas, 2010). A bank that wants to maximise profits should not utilize the inelastic side of the demand curve. For instance, where elasticity is less than one ($E < 1$), therefore elasticity will always be $\infty \geq E \geq 1$ (DemirgucKunt and Peria, 2010). Thus, the Lerner index measure competition at the bank level. Looking at the average over the entire sample period, Nedbank has the highest average Lerner index of 0.951, while Capitec bank has the smallest of 0.804, both of which are closer to 1. The results from the calculation of the Lerner index prove the South African banking market to be highly concentrated. This means there is a high market power for each of the banks since all of the five banks have a Lerner index closer to 1.

On the other hand, Capitec has the highest standard deviation of 0.127 oversample years compared with the other four dominant banks, whilst Nedbank exhibits the lowest standard deviation of 0.005. Meaning, Capitec differs more in quantity from other dominant banks from

the mean, whilst Nedbank differs less. Furthermore, all other banks indices included in the sample are above or almost equal to the mean except Capitec bank. The standard deviations that are positive show by how much the mean of Lerner index in the South African banking sector is above the marginal cost. This suggests a high possibility that the competitive the South African banking sector is, the more stable it is.

Table 4.3: Degree of Competition for Five Largest Banks in South Africa

Consolidated Five Dominant Banks Lerner Index					
Years	Mean	Median	St. Deviation	Minimum	Maximum
2006	0,796	0,938	0,213	0,409	0,950
2007	0,847	0,941	0,152	0,561	0,945
2008	0,858	0,946	0,146	0,581	0,959
2009	0,873	0,921	0,118	0,648	0,961
2010	0,901	0,934	0,077	0,753	0,961
2011	0,905	0,938	0,067	0,775	0,955
2012	0,905	0,931	0,057	0,794	0,951
2013	0,913	0,925	0,043	0,830	0,951
2014	0,914	0,929	0,040	0,836	0,949
2015	0,914	0,933	0,046	0,824	0,953
2016	0,910	0,931	0,048	0,817	0,948
2017	0,910	0,932	0,048	0,816	0,945
2018	0,915	0,939	0,052	0,813	0,949
2019	0,918	0,942	0,050	0,820	0,954

Source: Author's Estimations (2021)

Tale 4.3 above shows the consolidated results Lerner index for all the five dominant banks representing the entire South African banking sector. The mean and maximum values are highly similar to those obtained by scholars such as Iveta (2012) and Pruteanu-Podpiera *et al.* (2007), which applied the Lerner index to measure for competition in the Czech credit market in the period 2002–2005 and claimed that enhanced level of competition in the banking sector of Czech has led to more financial stability. Their conclusion claimed that the empirical literature on banking sectors of developed countries supports imperfect competition. The summary of these findings possesses some exciting characteristics pertaining to the South African banking sector. The results in table 4.3 above show that the level of competition for individual banks starts from 0.409 in 2006 to 0.954 in 2019, as indicated by the minimum and the maximum values. This imposes that some of the dominant banks in the sector have a low market power than the others, although they are regarded as part of the dominant when compared to the entire market. In summary, regardless of the high level of market power, the

mean values are closer to the minimum, which indicates two possibilities. The one suggests that banks with a high level of market power are fewer in number and are also isolated or vice versa.

On average, the level of market power of the South African banking sector was ranging at approximately 0,94 from 2006 to 2019, which is closer to 1 that reflects greater market power the banks have and thus indicates a monopoly supporting the literature of Pruteanu-Podpiera *et al.* (2007) with a standard deviation of 0.2 in 2006 to 0.1 in 2012, then further declined to 0.04 between 2013 and 2016. In 2018 and 2019, the standard deviation increased back to 0.1. In summary, the determination of the Lerner index returns market power is anticipated to be more for the South African banking sector since the literature of Boyd *et al.* (2009) claimed it as concentrated.

The results depicted in tables 4.2 and 4.3 above support that South Africa has a high level of market power and relatedly monopolistic behaviour, as found by Spierdijk (2008). This supports the literature since the findings of the Lerner index have proven the existence of concentration in the South African banking sectors (Carbo *et al.,* 2009). This indicates a negative impact on financial stability, as Gopalan and Rajan (2015) argued that bank competition is good for financial inclusion. Yet, the impact changes in the presence of a high degree of concentration. The second possibility is of the idea that the mean closer to the minimum values describe the type of competition in the market, and when these values are closer to zero, they suggest a monopolistic competitive banking system. This hypothesis is supported by the standard deviation, defined as the measure of deviation from the mean setting credibility to the conclusion of a competitive banking system. Further, information on the regression analysis of the Lerner index may be obtained from Appendix D.

Table 4.4: Revenue Regression Results for H-statistic calculation

VARIABLES	lnAbsarev	lnCaprev	lnFNBrev	lnSBKrev	lnNedrev
cad	0.169	-0.0190	0.181**	0.374	0.0365
	(0.0923)	(0.0259)	(0.0318)	(0.233)	(0.0583)
asset	0.914**	1.086***	1.151***	0.943**	0.812***
	(0.0616)	(0.0828)	(0.0859)	(0.0704)	(0.134)
aota	0.809	0.643**	-0.217	0.963	-2.394
	(0.162)	(0.223)	(0.211)	(0.410)	(2.588)
afri	-0.265	0.371	0.983**	-0.183	2.872
	(0.129)	(0.205)	(0.162)	(0.293)	(2.500)
ea	-0.0251	-0.0832	0.168	-0.320	0.930
	(0.270)	(0.0936)	(0.0649)	(0.259)	(0.634)
lo	-0.00725	-0.0320**	-0.0141	0.0103	-0.00176
	(0.0118)	(0.0114)	(0.00698)	(0.0106)	(0.0235)
Constant	0.508	8.404	6.957	0.802	3.079
	(1.315)	(29.41)	(13.77)	(0.712)	(2.076)

Source: Authors Calculations (2021)

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4.2.3 The Panzar-Rosse H-statistics Results

Table 4.4 above shows the descriptive statistics for the revenue equation that was used to obtain the variables that are relevant to the calculation of the Panzar-Rosse H-statistic. To observe the link between competition and financial stability, the H-statistic was as provided proposed by Claessens and Laeven (2004) is presented in the literature. Although, the prediction of this measure is prone to vary widely (Beck, 2008). Thus, this study utilised specifically the H-statistic of Bikker and Spierdijk (2008) to investigate the correlation between banking competition and financial stability, which differs from the estimates of Claessens and Laeven due to its simplicity and reliability.

Table 4.5 below provides the analysis and interpretation of the H-statistics results as the measure of bank competition (Bikker and Spierdijk, 2008). As per discussion in chapter 3, section 3.4.5.1, the H-statistic is obtained by summing the coefficients of the logarithm of bank's yearly revenue regressions made up of the division of total expenses to total deposits ratio, the proportion of total equity to total assets, and a proportion of the new loan to total loan. It can also be referred to Appendix C for the full regression analysis of revenue per individual bank.

Table 4.5: H-statistic results

Coefficients	Absa	Capitec	Nedbank	FNB	Standard Bank
λ_1	0,2652592	0,3555109	2,8722470	0,9755044	0,1830713
λ_2	0,0250970	0,7740360	0,9304255	0,1720625	0,3196861
λ_3	0,0072466	0,0302532	0,0017585	0,0168695	0,0103344
H-stat	0	1	4	1	1

Source: Calculated by the Author (2021)

The H-statistics figures have been rounded off to the nearest Rands

In a highly competitive environment, H-statistic is closer to 1 and achieves more stability in a less competitive environment H-statistic is less than 1, and by the theory of Bikker and Spierdijk (2008), it reflects less stability of a bank. According to the findings of the H-statistic in Table 4.5 above, different conclusions are drawn amongst the five largest South African banks. As per discussion in section 3, the near the H-statistic to 1 indicates a highly competitive bank. This entails that a high degree of competition enhances the financial stability of well-developed banks and deteriorates that of vulnerable ones. The H-statistic from Absa bank is 0, indicating that the type of competition existing is the monopoly/oligopoly and supports the competition fragility hypothesis. Capitec, Ned, and Standard bank have H-statistic that is equal to 1, suggesting a highly competitive environment and more stability since the selected banks are more developed within the sector. Absa has an H-statistic that equals zero suggesting monopolistic competition, which is associated with even more stability. Using the H-statistic, the study failed to reject the null hypothesis that the banking environment of South Africa is competitive. The H-statistic for Nedbank is ambiguous. The predicted H-statistic for all the five banks is positive and significant. Thus, reject the null hypothesis that these banks are monopolists since $0 < H$. This study results satisfy the mixed conditions and therefore are in support of various studies such as Freixas and Ma (2014), who claimed that financial stability is improved in a highly competitive environment and eliminates competitors in the sector.

4.3 Results of Bank Concentration and Financial Stability

4.3.1 Analysis of Concentration in the SA banking sector

This subsection presented the findings of the South African banking sector concentration using two different measures, including concentration ratios (CR5 and CR3) and the Herfindahl-Hirschman Index (HHI) for assets. The total market shares were not available from various sources. Thus two banks were added to the five banks to compute the market share. The other

two banks that were added are African Bank and Grindrod. The assets of these two additional banks were added to the total assets of the five largest bank assets to get the market share that was used in this study.

Table 4.6: Concentration Ratios and HHI for assets of five large banks in South Africa

Year	CR3	CR5	HHI
2006	0.200	0.249	2492
2007	0.207	0.251	2512
2008	0.212	0.251	2515
2009	0.204	0.247	2471
2010	0.199	0.244	2443
2011	0.199	0.242	2424
2012	0.198	0.239	2392
2013	0.193	0.235	2352
2014	0.195	0.237	2375
2015	0.197	0.240	2405
2016	0.194	0.239	2395
2017	0.196	0.239	2391
2018	0.212	0.248	2487
2019	0.211	0.249	2497

Source: Calculated by the author (2021)

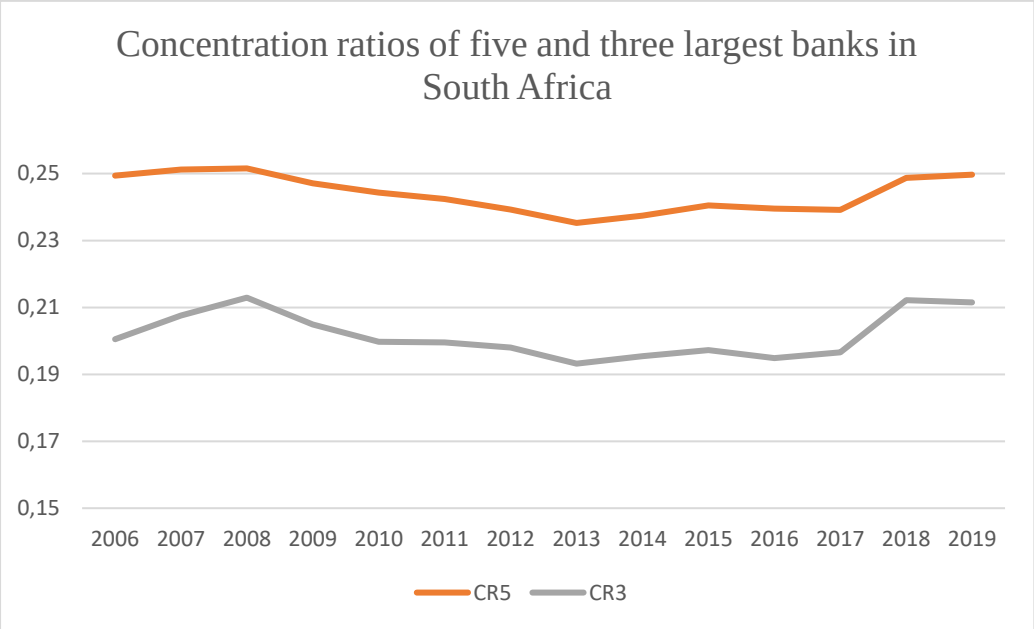
The concentration is one of the measures used in this study to proxy for competition within the South African banking sector following the trails of Kick and Prieto (2013); Khumalo and Mishi (2019). The banking sector in South Africa has generally been characterised by five dominant banks. The essential indicator for measuring the degree of concentration included the CR5 concentration ratio through weighing the market share of the five largest banks in the South African banking system. The concentration ratio of the five-banking sector at the end of 2006, which was the beginning of the study period, yet before the global financial crisis, was 0.249 and slightly increased by 0.02 percentage points to 0.251 by the end of 2007 when the global financial crisis commenced. By the end of the global financial crisis (end of 2009), the concentration ratio continuously decreased slightly until the end of 2013 (to 0.235). Then it started to increase at the end of 2014 to 0.37 continuously to 0.249 at the end of 2019, which is the end of the study period. The concentration ratios of the three dominant banks (CR3),

including Absa, Standard Bank, and first rand bank was initially at 0.2 by the end of 2006 and had been stable until the end of 2009 (which is the end of the global financial crisis). It then started to decrease to 0.199 in 2010, possibly affected by the lagging effects of the global financial crisis, and it was stable until the end of 2017, where it was sitting at 0.196. In 2018, the concentration ratios increased steadily to 0.211 in 2019.

On the other hand, the HHI for assets has demonstrated a similar sequence to that of the concentration ratios with minor variations in figures. The concentration during the first two years of the global financial crisis commencing from 2007 till 2008 has reached 2515, showing high market domination confirming what has been said in the literature of concentration by Church and Ware (2000) alluded in chapter 2, then 2471 by the end of 2009 which was still closer to 2500 criterion. All the values of the HHI had been above the criteria of 1800, which is considered a threshold for the high level of concentration in the banking system, confirming the claims in the literature by Church and Ware (2000) about the South African banking sector. The HHI calculations for all components are based on the Kwoka version (1985); Arjan (2010).

The trends of the results of C5, CR3, and the HHI are further graphically depicted in the two-line graphs below (figure 4.1 and 4.2) in addition to the descriptive statistics provided in table 4.6 above.

Figure 4.1: The concentration ratios for five and three dominant banks



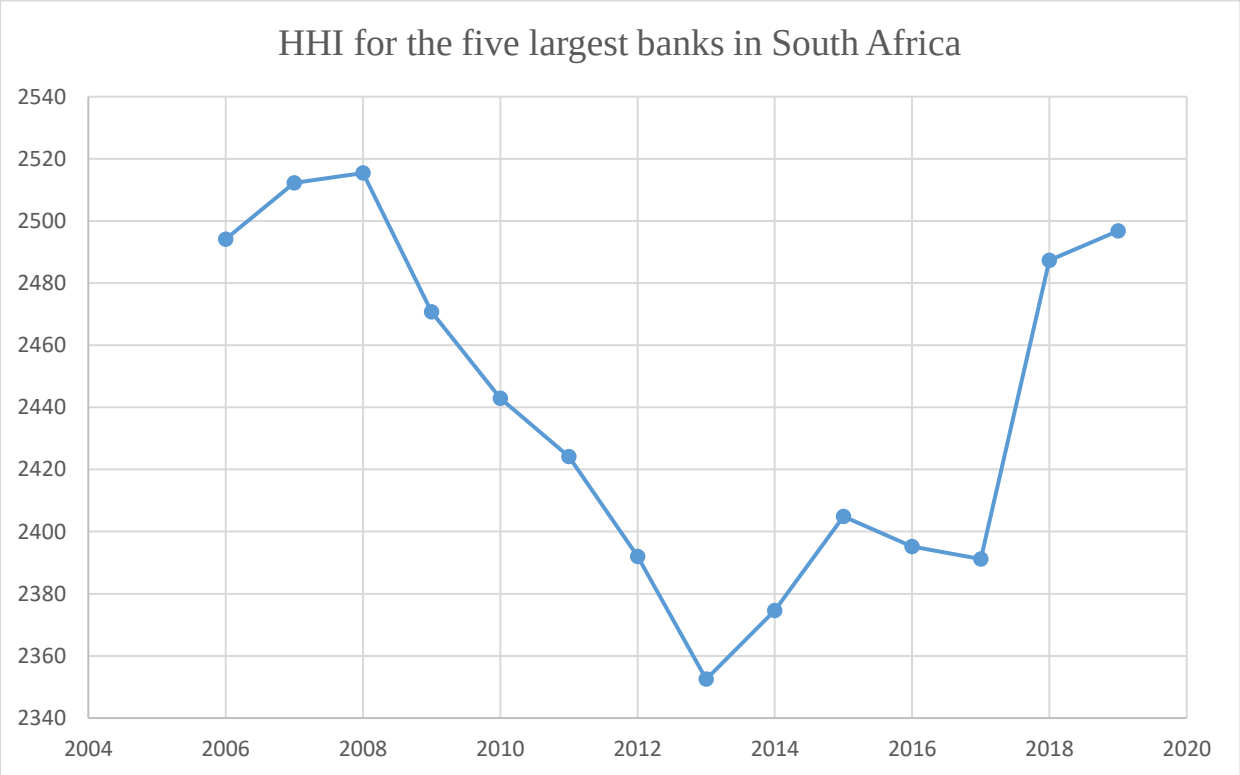
Source: Constructed by the author (2021)

The results from the CR5 and CR3 ratios in table 4.6 are used in this study to analyse bank concentration. However, amongst the selected largest five and three banks which qualify according to their market shares, they all differ in the potential to a large mass of banking environment. According to the trend for CR5, the ratio started to increase at a decreasing rate above 25 percent in 2006 and drastically decreased until 2013 below 25 percent, then after it slightly increased at an increasing rate, but below 25 percent until 2015. It then moved constantly until 2017, where it started to rise at an increasing rate.

The CR3 followed the same pattern as that of the CR5, with the exception that the threshold was 21 percent. It initially increased at a decreasing rate above 21 percent in 2006 and drastically decreased until 2013 below 21 percent, then it slightly fluctuated at an increasing rate, but below 25 percent until 2015. It then moved constantly until 2017, where it started to rise at an increasing rate.

Figure 4.1 above demonstrates a pattern of these two ratios (CR5 and CR3), showing the degree of dominance by the few large banks in the South African banking sector. Recap: the two trends are the graphical representation of the results that were presented in table 4.6.

Figure 4.2: Herfindahl-Hirschman Index for five dominant banks in South Africa



Source: Constructed by the author using excel (2021)

The values of the Herfindahl-Hirschman Index (HHI) in Figure 4.2 above present a comprehensive description of concentration by weighing larger banks more in the South African banking sector. The trend in figure 4.2 above depicts the HHI values for assets of which is more than 1800, indicating a concentrated South African banking sector. As shown by the HHI values, there was an intensifying degree of concentration from 2006 to 2008 in the South African banking sector. Then, started to drop until 2013, where it started to rise again until 2015 drastically. From that period, the concentration level slightly decreased until 2017. From 2017 it increased towards approximately 2500. In summary, the HHI values for assets were more than 1800, suggesting a market concentration in the South African banking sector and less efficiency, which has a negative implication on financial stability as guided by Mishi and Tsegaye (2012), particularly for less developed banks.

4.4 Analysis of South African Bank Stability Results

The purpose of this section was to analyse the results of the key factors of financial stability, with the aim to evaluate the relationship between bank competition and financial stability in the South African banking sector (the key objective of the study). Hence, each specific bank variable was sought and structured into pooled data series, meaning for each of the dominant banks over time. This process enabled a simple understanding of the effect across banks over time since other estimation techniques such as simple OLS and other time series measures are constrained when it comes to the handling of this type of data. But, since the subjective assumptions alone are not efficient, Hausman tests were also utilised to inform the selection of the efficient assumption objectively (Green, 2008). The key variables are presented in Tables 4.7 and 4.8 and graphically represented in figure 4.3 below. This subsection presents the detailed analysis and interpretation of the results, in the form of tables and figures, to measures the financial stability for South African banks. The variables that are used in this study are Z-sore and profitability, as alluded to in methodology chapter of this study.

4.4.1 The Z-score Results

Table number 4.7 below represents the findings of the Z-sore calculated using the secondary data obtained from each bank's financial statements. This subsection further gives a graphical representation of the Z-score values in figure 4.3. The larger the value of the Z-score, the stronger the bank is, meaning an enhanced level of stability and vice versa (Schaeck and Cihak, 2008), as discussed in chapter 3, subsection 3.4 in the preceding.

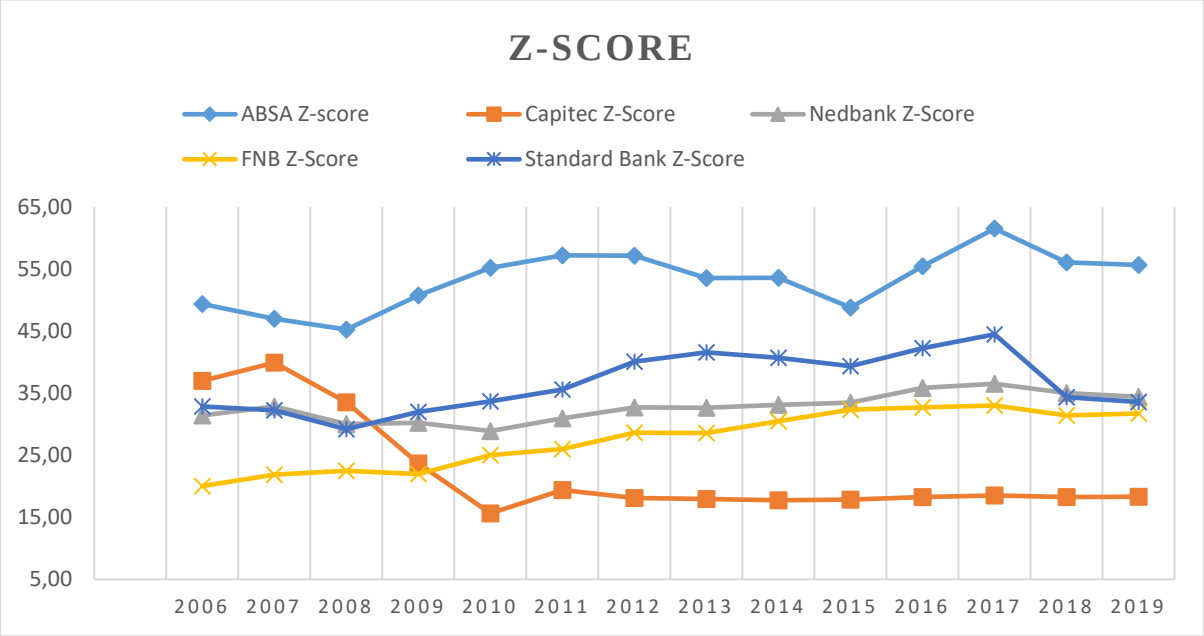
Table 4.7: Z-score for Five South African Largest Banks

Years	ABSA Z-score	Capitec Z-score	Nedbank Z-score	FNB Z-score	Standard Bank Z-score
2006	49,40	36,99	31,43	20,04	32,85
2007	47,03	39,93	32,86	21,89	32,24
2008	45,27	33,56	30,03	22,48	29,20
2009	50,79	23,66	30,23	21,98	32,00
2010	55,21	15,64	28,91	25,05	33,72
2011	57,20	19,38	30,94	25,99	35,62
2012	57,16	18,11	32,73	28,62	40,10
2013	53,54	17,98	32,66	28,60	41,59
2014	53,64	17,73	33,12	30,50	40,73
2015	48,83	17,85	33,49	32,35	39,37
2016	55,49	18,28	35,89	32,71	42,28
2017	61,53	18,51	36,52	33,03	44,50
2018	56,10	18,27	35,03	31,43	34,36
2019	55,67	18,30	34,44	31,73	33,59
Average	53,34	22,44	32,73	27,6	36,58

Source: Calculated by the Author using Data from Financial Statements (2019)

Table 4.7 above represents the z-sores for the selected dominant banks in the South African bank sector. It can be clearly observed that there are banks with high values of Z-score and those with lower values of the z-sores, although all the five measured banks are grouped as the big five in the South African banking system. Absa bank had more a higher Z-score of 53.34 on average between the period from 2006 to 2019 than all other four banks in the study, followed by Standard bank (36.58), Nedbank (32.73), FNB (27.6), and Capitec (22.44). Capitec had the lowest average of the Z-score, meaning it is the weakest amongst the presented banks and most likely to contribute towards less to financial stability as compared to the other four banks. On the other hand, Absa had a large value of the Z-score on average, meaning it’s a stronger bank and more financially stable.

Figure 4.3: Z-score for five large banks in South Africa



Source: Constructed by the author using excel data (2021)

Graphical representation of Z-scores for the chosen banks in South Africa is displayed in figure 4.3. The greater value of the Z-score means the bank is taking the lower risk. The mean of the Z-score calculated is always 0, and the standard deviation (or variance) always increases by 1 unit. Referring to the Basil accords such as capital adequacy requirements, the trend in figure 4.3 is the graphical representation of the descriptive statistics in table 4.7. A bank that has the lowest assets shows less power to take a risk. Hence the bank will be more stable. However, the empirical results shown in figure 4.3 above, Absa has the Highest Z-score, which proves to be the most efficient of the five dominant banks in South Africa. Standard bank has consistently had the high Z-score over time from 2008 and currently has the second-largest Z-score, whilst Nedbank has maintained the third-largest position from the same year, then followed by FNB, which demonstrated a significant increase of its Z-score indicating an adjustment of the bank from imprudent to prudent behaviour. Lastly, Capitec Z-score had demonstrated an increase at a decreasing rate before the global financial crises, then started to decline during the global financial crises and continued to be stable till the end of 2019. Capitec Z-score was the least of the five dominant banks from 2010 to 2019 after it drastically decreased from 2007.

Further, from figure 4.3 above representing the Z-score trends for five dominant banks, two broad groups were identified, the one with high Z-scores values indicating those are increasing and the other ones with low Z-scores values, which are decreasing by nature. This division is a general fixture characterising the South African banking sector. The division has a negative

impact on competition amongst the banking sector since the system is characterised by few large banks with the possibility to engage in radical actions aiming to compete with major banks. As a result, this contributes towards the constant decline of another bank's Z-score.

Table 4.8: Descriptive Statistics for the Z-score of Five Dominant Banks in South Africa

Variables	Absa	Capitec	Nedbank	FNB	Standard bank
Mean	53,35	22,44	32,73	27,60	36,58
Standard Error	1,21	2,16	0,60	1,23	1,26
Median	54,42	18,29	32,79	28,61	34,99
Standard Deviation	4,52	8,07	2,26	4,62	4,71
Sample Variance	20,42	65,20	5,11	21,32	22,22
Kurtosis	-0,43	0,73	-0,74	-1,49	-1,30
Skewness	-0,23	1,50	0,03	-0,36	0,21
Range	16,26	24,29	7,61	12,99	15,29
Minimum	45,27	15,64	28,91	20,04	29,20
Maximum	61,53	39,93	36,52	33,03	44,50
Sum	746,87	314,19	458,28	386,38	512,15
Count	14,00	14,00	14,00	14,00	14,00
Confidence Level (95,0%)	2,61	4,66	1,30	2,67	2,72

Source: calculated by the author using excel (2021)

The descriptive statistics for the financial stability measure variable of each bank used in this study are presented in table 4.8 above. From the descriptive statistics presented above, it is observed that some banks have a high Z-score than the others amongst the five categorized as largest banks (Demirgüç-Kunt and Huizinga, 2013), meaning more standard deviation above the mean. This further entails that within the five dominant banks, some banks are more efficient compared to others. The value of the Z-score tells how many standard deviations away from the mean (Demirgüç-Kunt and Huizinga, 2013). The standard normal distribution comprises a normal distribution characterised by a mean of zero and a standard deviation of 100 percentage (Demirgüç-Kunt and Huizinga, 2013). For instance, Absa has the highest mean of 53.35, followed by standard bank and Nedbank with 36.58 and 32.73, respectively. The other two banks have a low mean for z-sore being FNB and Capitec with the mean of 27.60 and 22.44, respectively, as displayed in the table above, corresponding to the average in table 4.7. In conclusion, the values presented above generally support the trends of banking stability over the sample periods in the presence of competition in the South African banking sector. Mostly, confirms the competition results in stable banking as indicated by the literature of Beck *et al.* (2013); Leroy and Lucotte (2017); Liu *et al.* (2013). Z-score is used as the financial

stability measure, and the associated estimation finds that bank competition is negatively associated with financial stability. This is in line with the competition-fragility hypothesis (Kick and Prieto, 2015; Liu and Wilson, 2013).

4.4.2 Analysis Profitability and Financial Stability Results

In testing the relationship between bank competition and financial stability, another measure of the stability of a bank is the profitability since the greater the profit owned by the bank can be said bank's benefit. Profitability is used in this study to measure financial stability, hence the return on asset (ROA) has been used to proxy for profitability following the studies of Boyd and Runkle (1993); Beck, Demirgüç-Kunt, Levine (2007); Demirgüç-Kunt, Detragiache, and Tressel (2008); Laeven and Levine (2009); Čihák and Hesse (2010). The two tables below (4.9 and 4.10) represent the ROA for the five largest banks operating in South Africa to determine the degree of financial stability (Čihák and Hesse, 2010). ROA is mostly used when comparing the bank's performance between periods or when comparing two or more different banks of similar size categories operating in the same industry. The first table, 4.9, shows the ROA values for the five dominant banks, then the second table, 4.10, shows the average, median, and standard deviation of the ROA values presented in 4.9 for all five largest banks in South Africa.

Table 4.9: Return on Assets (ROA) for concentrated South African banking system

Years	Absa ROA	Capitec ROA	First Rand Bank ROA	Nedbank ROA	Standard Bank ROA
2006	1%	9%	1%	1%	3%
2007	1%	8%	1%	1%	3%
2008	1%	8%	2%	1%	3%
2009	1%	6%	1%	1%	2%
2010	1%	5%	1%	1%	2%
2011	1%	5%	1%	1%	2%
2012	1%	5%	1%	1%	2%
2013	1%	4%	1%	1%	2%
2014	1%	4%	2%	1%	2%
2015	1%	5%	2%	2%	2%
2016	1%	5%	2%	2%	3%
2017	1%	5%	2%	1%	3%
2018	1%	5%	2%	1%	2%
2019	1%	5%	2%	1%	2%

Source: Author's calculations using excel (2021)

Percentages are rounded off to the nearest rand

The return on assets (ROA) is the typical index to measure bank profitability and financial stability relationship. This index shows the capability of a bank towards making profits from its asset administration functions. From figure 4.9 above, four of the banks that are included in the sample had a ROA below 5 percent, indicating that these banks are asset intensive for the entire sample period. Whilst, Capitec bank has been above 5 percent but below 20 percent in the first four years of the sample period (2006 to 2009). This is an indication of a non-asset intensive, nor asset lite bank as discussed in chapter 3, under section 3.7.2.1 (Guru, 1999). Only in 2013 and 2014, the ROA for Capitec bank went below 5 percent, indicating the asset intensiveness of the bank and further increased to 5 percent in the years after 2014 in the sample of this study.

Table 4.10: Return on Asset: mean, median, and standard deviation

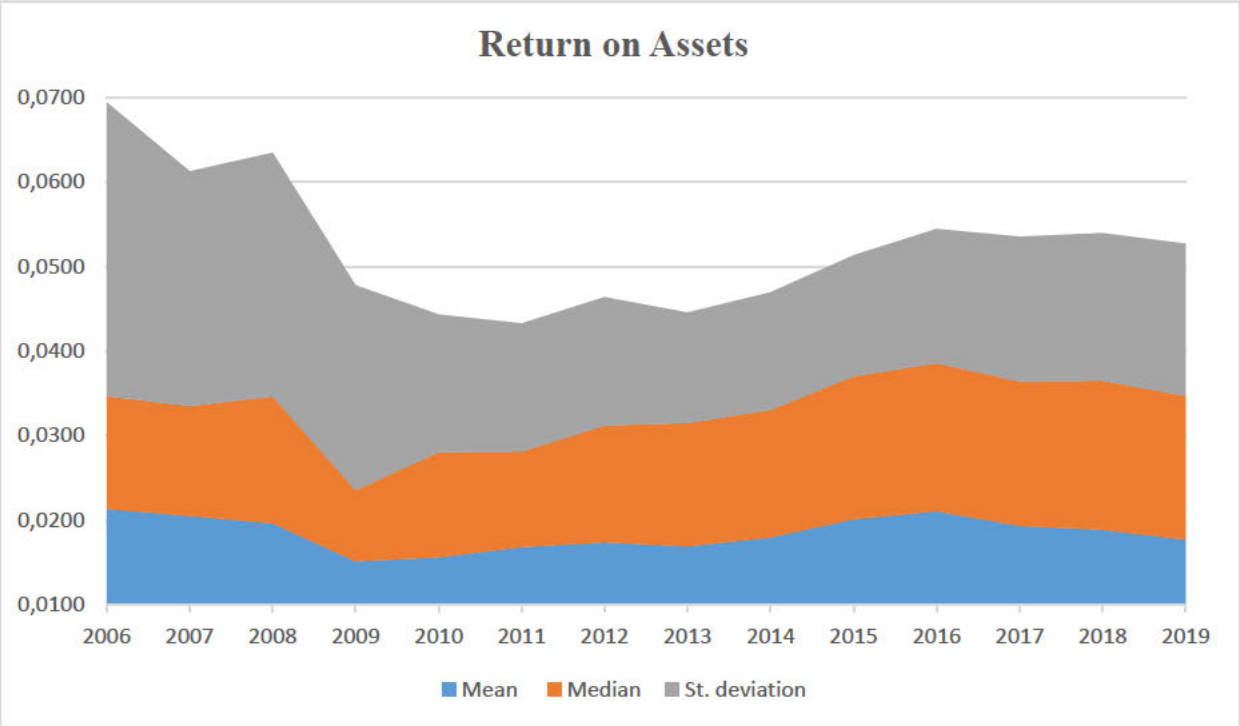
Years	Mean	Median	Standard. deviation
2006	0,0214	0,0133	0,0348
2007	0,0205	0,0130	0,0278
2008	0,0196	0,0150	0,0288
2009	0,0151	0,0084	0,0242
2010	0,0156	0,0124	0,0163
2011	0,0168	0,0113	0,0152
2012	0,0174	0,0138	0,0152
2013	0,0169	0,0146	0,0130
2014	0,0180	0,0151	0,0139
2015	0,0201	0,0169	0,0143
2016	0,0211	0,0175	0,0159
2017	0,0193	0,0171	0,0171
2018	0,0189	0,0176	0,0175
2019	0,0177	0,0170	0,0180

Source: Author's calculations using excel (2021)

This study used the annual values to calculate the standard deviation of the return on assets (ROA). From table 4.10 above, which gives the mean, median, and standard deviation of the ROA tabled in 4.9. The higher standard deviation of the bank demonstrated the lower risk index values the bank has (Guru, 1999). In general, the extreme lower risk index values suggest a potential higher risk for the banks. This study also used average ROA across various time windows of the sample (the best alternative), as preferred by Lepetit and Strobel (2013). The observations from findings were that the risk index generally decreases in value as the size of the window (number of years) increases, suggesting potential higher risk, as evidence in the mean values shown in table 4.10 above. For instance, the mean value in 2006 was 0.0214 and decreased to 0.017 in 2019. On the other hand, the overall standard deviation has also decreased over time from 0.0348 to 0.018.

The changes in the return on assets are graphically represented in figure 4.4 below. Showing the adjustment in the average and the standard deviation of banks over time.

Figure 4.4: Line graph depicting mean, median, and standard deviation for five banks over year



Source: Authors Construct using excel (2021)

Figure 4.4 above showed a graphical representation of the Z-score mean, median, and standard deviation, which were shown in table 4.10. These mean, median, and standard deviation values were developed using the Z -score values presented in table 4.10, which were regressed from the values that were presented in table 4.9 of this chapter. From figure 4.4, the standard deviation is positive and above the mean average values. Using the Z-score and profitability as indices suggest that the South African banks are more profitable, and that bank competition contributes positively in relation to financial stability.

The key reason for these empirical findings, regarding the profitability, can be associated with the prospect that the South African banks are monopolistic by nature and highly concentrated, represented by five large banks (PWC, 2015). Thus, profitability might not be influential except when the study compared the profitability of banks in different countries.

4.5. Discussion of the Results

This study was aimed to investigate the relationship between bank competition and financial stability. The study used different models to measure bank competition and financial stability.

However, some findings of the various tests conducted has proven that as the bank competition intensifies, the volume of financial stability increases for larger and developed banks and deteriorates for vulnerable banks.

Remarkably, this chapter found that some of the different measures of bank competition are ineffectually correlated. Also, found that the effect of bank competition on financial stability may vary with the measure of financial stability used supporting, Canoy *et al.* (2001); Carletti and Hartmann (2003) who argued that greater level of bank competition may be good for (static) efficiency, but bad for financial stability. Furthermore, Keely (1990) that in a banking system that is highly competitive the management is more willing to participate in risky transactions. As a result, this lowers the charter values and decreases financial stability of the banks. For instance, when Z-score measurement was used as the profitability index for stability measurement, the bank competition measures such as H-statistic, Lerner, and Boone that are non-structural measures mostly highlighted a negative link between bank competition and financial instability. Both the Lerner index and Boone indicator measures are associated with a positive relationship between bank competition and financial stability. H-statistic was constantly insignificant. Meaning that when bank competition increases, the financial stability also intensifies.

The results using systemic stability measures were also statistically insignificant when the concentration was used to measure bank competition. The results have shown that there is a negative relationship between bank competition and financial stability. Meaning that when these indices were used in this study, bank competition was found to result in financial instability, consistent with the concentration fragility hypothesis.

Zigraiova and Havranek (2016) proved that the correlation between bank competition and financial stability varies with the definition of the measure used for stability. This chapter's results are in supporting their findings. Generally, no reliable evidence relating to bank competition and financial stability was found using these data on South African banks. Further, according to the findings of this study, it worth noting that the two strands of bank competition are not genuinely opposing.

Literature review of this dissertation suggested a response to all objectives. For instance, the literature of Schaeck *et al*. (2009), proposed that there are two strands identified to exist in the analysis of bank competition and financial stability for the countries, namely competition-

stability hypothesis (by Canoy *et al.*, 2001; Carletti and Hartmann, 2003) and the competition fragility hypothesis (by Keely, 1990). The traditional competition-fragility hypothesis claims that high bank competition erodes market power, reduces profit margins, and causing the elimination of franchise value (Marcus 1984; Keeley, 1990; Demsetz, Saidenberg, and Strahan 1996; Carletti and Hartmann, 2003), takes a contrary competition stability hypothesis. This hypothesis argues that more market power may lead to riskier decisions taken by the dominant banks, particularly in a concentrated banking sector due to the idea that they are too big to fail (Boyd, De Nicolo, and Jalal (2006); De Nicolo and Loukoianova (2006). Thus, there was no one size fit all solution to answering this objective (De Nicolo and Loukoianova, (2006). The arguments from the evidence of the reviewed literature by scholars such as Beck, Demirgüç-Kunt and Levine (2006); Schaeck, Čihák and Wolfe (2006) in the same field of studies are also discussed.

CHAPTER 5: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This study reviewed the literature on banking competition and then its impact on financial stability. Further, this study followed many scholars who claims that the banking sector plays a crucial role in channelling funds from surplus to deficit units and expected to facilitate economic development through financial inclusion, and job creation. Thus, it is important have both stable and competitive banking sector. Most economic theories have a complex meaning about the correlation the competition and financial stability. Furthermore, some economists found that bank competition enhances financial stability. As a result of the opposing theories about the link existing between bank competition and financial stability, scholars and economists realised a need for empirical testing of this correlation amongst the two variables. As a result, three research questions have been formulated in this study in order to answer the three research questions. The first question was, about the level of bank competition and the degree of concentration in the South African banking sector? Second question, about the effect of bank competition and financial stability in the South African banking sector? Lastly, how does bank concentration affect the financial stability of South African banks? These three research questions were formulated in other to investigate the relationship between bank competition and bank financial stability in the South African banking sector.

The key aim of this thesis was to examine the relationship between bank competition and financial stability with the purpose was of categorising findings towards answering the research questions guided by the four objectives of this study. The four research objectives were first; (i) To identify the level of competition and concentration in the South African banking sector; (ii) To determine the effects of bank competition on the stability of the South African banking sector; (iii) To determine the effect of concentration on bank stability in the South African banking sector. (iv) To assess the causality of bank competition and the stability of the South African banking sector. In order to achieve these objectives, a competition/stability model was adopted and both measure of bank competition, concentration and financial stability were utilised.

The remainder of this chapter firstly summarises each chapter of the study. Secondly, summarise the conclusions on the results and analysis by aligning each objective of this study. Thirdly, provide recommendations that policymakers need to consider that the effects of competition on banking sector stability. Fourthly, indicate the limitations experienced towards

answering the research questions and filling further gaps. Lastly, but not least, the study indicates the areas of improvement in future research studies.

5.2 Study Summary

The economic theory could be ambiguous when projecting the effect of the bank of competition on financial stability. Hence, the effect of bank competition is more complicated and cannot only be analysed through the traditional measures or the level of domination by the few largest banks. This is mostly the case in a highly monopolistic industry, where each bank has strong market power over their fellow segment sectors. Although, there is no sufficient investigation on the effect of bank competition on financial stability this far in the South African context alone.

Literature reviewed both the theoretical and empirical literature on bank competition and financial stability. Thus, the literature aimed to fill in the gap existing in the literature by investigating the impact of competition on stability in the South African banking sector context. The investigation of the literature suggested that there is an existence of two hypotheses that suggest opposing effects. Firstly, competition fragility hypothesis, banks are exposed to the risk of reduced interest margin, elimination of market power, which will lead to a decline in franchise value. This motivates the ability for banks to engage in riskier activities to enhance the return, which causes financial stability to deplete. Secondly, the competition stability hypothesis, there is less market power which means there will be more credit facilities available, and the interest will be cheaper, making it easy for borrowers to repay loans, and it further eliminates any risks aligned with larger lending rates, this enhances the stability. Then discussed the literature behind both structural and non-structural measures of bank competition as well as the literature on measures of financial stability.

Chapter 3 has provided a detailed methodology that was used in the study. The discussion of the methodology includes detailing the models that were used to achieve the study objectives and answer the research questions. It has been argued that these effects may hold at the same time, implying trade-off stability. The study used four measures of bank competition over a period from 2006-2019, namely, the Lerner index, Boone indicator, H-statistic, and concentration (proxied two traditional measures namely, Herfindahl-Hirschman Index (HHI) for assets and the concentration ratios (CRs) for South African banks. Each measure was utilised separately towards observing the correlation between bank competition and financial

stability of each bank, as per research objectives. The bank's overall risk or financial stability was estimated by the bank level Z-scores and profitability (proxied by return on asset (ROA)).

Chapter 4 presented the analysis and discussion of the results. Study findings suggested significant insights for policymakers specialising in developing policies for conducive level of competition in the banking sector in South Africa. Initially, the study evidence suggested that bank competition decreases financial stability, the economic relevance of this outcome was adequate. On the other hand, the results also suggested that bank competition may worsen the conditions of the well-performing banks and works at an advantage to those banks already sinking. From these conclusions, a trade-off needs to be considered when measuring the effect of bank competition on financial stability.

5.3 Conclusions on the Bank Competition, Concentration and financial Stability

The conclusion and implication of the results were structured around the four objectives of the study, which aimed at answering the research questions around the bank competition and stability of the South African baking sector using five dominant banks namely, Absa, Standard bank, 02. The achievement of the four objectives of this study is discussed in detail below.

5.3.1 Conclusion on the level of competition and its implications on financial stability in South African banking sector

This sub-section provides a summary on how the study went about achieving research objectives which were to identify the level of competition and concentration in the South African banking sector, and to determine the effect of bank competition on the stability of the South African banking sector. Different results were obtained from each of the non-structural models being the Lerner index, Boone indicator and the H-statistics as expanded on below;

Boone indicator

The results obtained using this non-structural measure showed observations of a lower degree of competition in the South African banking which sector supported a descriptive statistic in the empirical evidence by Boone *et al.* (2004) presented before in the literature review regarding a high degree of concentration. Therefore, the banking sector of South Africa meets the definition of an oligopoly. In general, when the bank competition is weak, the volatility of market shares rises, supporting the need for output reallocation.

The Lerner index findings

The analysis of these results addressed research objective one and number two of this study by empirically proving that the SA's banking sector highly concentrated with the Lerner index closer to 1. Meaning there is a lower level of competition and high level of concentration within the South African banking sector.

H-statistic

In a highly competitive environment, H-statistic is closer to 1 and achieves more financial stability in a less competitive environment. When the, H-statistic is less than 1 and by the theory, it reflects less stability of a bank. Supporting competition stability hypothesis. Then, the finding of the study was there is a high level of competition for all other four banks namely, Standard bank, Capitec, FNB and within the sample except for one bank, Absa.

According to the three of the non-structural measures of bank competition and financial stability namely, Boone indicator, the Lerner index and H-statistic. The South African banking sector has been found to be highly concentrated and less competitive. This has a negative effect on the financial stability of less developed banks whilst it works in the favour of the well-developed banks within the South African banking sector.

Concentration

Concentration is a structural measure of measure of bank competition that was adopted in this study on top three non-structural. It was proxied for, using the Herfindahl-Hirschman Index (HHI) and the concentration ratios (CRs). All the concentration ratios were positive but below 50 percent highlighting a low level of concentration in the South African banking sector. These results were not what was expected by the research and did not support what has been said in the literature which is a good indication. On the other hand, when the HHI was used the findings (more than 2300 for all the five banks over the years) showed a highly concentrated banking sector in South Africa. Given that all the values of the HHI had been above the criteria of 1800, which is considered a threshold for the high level of concentration in the banking system. The findings obtained using the HHI have confirmed the expectations of the researcher and it is bad for the South African banking sector, particularly the undeveloped banks.

5.3.2 Conclusion on the effect bank competition and concentration in the South African banking sector

The results of the structural measures of bank competition have proved that, the South African banking sector to be dominated by a few large firms and supported the competition fragility

view in line with the literature reviewed in this study. The non-structural measures of bank competition have provided the mixed results about the market power (or level of domination), that exist in the South African banking sector and its effect on financial stability. Some banks are good and some are at a detrimental level of competition.

Judging from the findings of the return on assets (ROA) it shown that all of the other four banks, except for Capitec are had a ROA below 5 percent, indicating that these banks are asset intensive for the entire sample period. Whilst, Capitec bank has been above 5 percent, except for 2013-2014, but below 20 percent in the first four years of the sample period which indicate non-asset intensive (meaning below average levels of capital are required in order to operate). This is a good thing for the South African banking sector of South Africa.

Another measure used in this study for the banks financial stability is the Z-score. The rule of thumb on the findings was that the mean of the Z-score calculated is always 0, and the standard deviation (or variance) always increases by 1 unit. The findings have indicated two broad groups were identified, the one with high Z-scores values indicating those are increasing and the other ones with low Z-scores values, which are decreasing by nature. This division is a general fixture characterising the South African banking sector. The division has a negative impact on competition amongst the banking sector since the system is characterised by few large banks with the possibility to engage in radical actions aiming to compete with major banks. As a result, this contributes towards the constant decline of another bank's Z-score. Which is a bad thing for the economy.

5.3.3 Conclusion on the link between competition and the financial stability in the South African banking sector

In the presence of the findings from chapter 4, the analysis used several indices of bank competition and financial stability. The findings of this analysis were that the bank competition had fewer relations and addresses various components of bank competition. The observations on the impact of bank competition on financial stability differed according to the indicator used for financial stability. For instance, when the Z-score measure was utilised as an indicator for a bank's financial stability, the findings showed that bank competition and bank stability are positively correlated, which seconded the competition-stability hypothesis. Although, the related indicators, which is profitability, projected that bank competition impacts were commonly insignificant.

In summary, the findings of this study concluded that there is no fixed effect from bank competition and financial stability relationship. However, the core policy implication of the findings is that the relaxation of regulatory restrictions and the promotion of competition in the banking sector is less likely to enhance stability in countries' financial systems.

Competition plays a significant role towards achieving a stable financial status of the South African banks as well as the economy at large. The findings of this study support that bank competition is important for financial stability of the banks. However, it worth noting that the study further shows that it can do so to a certain level. This chapter generated conclusions cantered on the results of this research and towards achieving the study objectives formed in the introduction and background of this study. It is important to note that conclusions are in accordance with the results and other literature discussed earlier in the literature review of this study.

5.4 Policy Recommendations

Based on the findings of this study, which aimed to investigate the effect of competition and concentration on financial stability of the South African banking sector, firstly, that claims that high competition enhances financial stability of the banks, it is recommended that policy markers/regulators develop strategies that will assist to encourage bank competition.

The last recommendation results from a set of findings that high level of concentration results in financial stability for developed banks in the expense of underdeveloped banks which suggested that policymakers may need to consider developing policy or strategy that will generate a minimal level of concentration to avoid bettering the financial stability of bigger banks in the expense of the developing or underdeveloped banks. Which is bad for the banking sector of South Africa.

5.5 Study Limitations and Areas of Improvement for Future Studies

5.5.1 Study Limitations

The research aims and objectives of this study may have been fully met, however, gaps and limitations have been identified, a few which are listed below:

The first limitation was the shortage of the secondary data availability for commercial banks operating in South Africa, which is one of the reasons this study limited its scope to the five

largest banks that operated from 2006 to 2019. Hence, the chosen sample of the study included five dominant banks which survived during the global financial crisis period or the largest banks, which began their operations at any date prior to 2017. This sample is affected by domination and survivorship bias. Even the results in chapter 4 of this study were derived from a domination sample. Earlier empirical investigations studies by Delis and Kouretas (2011); Demirguc-Kunt, Detragiache, and Gupta (2000), based on bank-level data, further indicated that the domination and survivorship bias as one of the limitations of bank-level studies.

There second limitation, there were also challenges relating to limited effect of adjustments in bank competition and concentration of many banks, within the South African banking sector. However, the presence of those limitations did not prevent the study to achieve its objectives. Although, more including effect adjustment would have been achieved in the absence of these limitations.

5.5.2 Areas of Future Studies Improvement

Future research studies could be based on the following areas: Firstly, investigate how do banking sector regulation impacts competition and concentration and the resulting effects on financial stability, using the new strategies to be developed by policy makers. Secondly, future research can and analyse how changes in competition impact the earnings per share to help reduce the effect of competition on the monetary policy. Lastly, dynamic models may be used to improve the analysis.

REFERENCES

Abbasoğlu, O. F., Aysan, A. F., and Gunes, A. (2007). Concentration, competition, efficiency, and profitability of the Turkish banking sector in the post-crises period, no. 5494. Available from http://mpra.ub.uni-muenchen.de/5494/. Accessed on 22 June 2020

Aggarwal, R. and Jacques, K., T. (2001). 'The impact of FDICIA and prompt corrective action on bank capital and risk: Estimates using a simultaneous equations model'. *Journal of Baking and Finance*, Vol 25, no. 6, pp. 1139- 1160.

Aghion, P., Bloom, N., Blundell, R., Griffith, R. and Howitt, P. (2002). Competition and innovation, The Institute for Fiscal Studies, Working Paper 02/04.

Aghion, P. Bloom, N. Blundell, R. Griffith, R. and Howitt, P. (2005). 'Competition and innovation: an inverted-U relationship', *The Quarterly Journal of Economics*, Vol. 120, pp. 701-728.

Ahern, D. (2017). 'Return on Assets: How to Find Banks That Generate Profits', *Seeking Alpha Journal*, Vol. 20, pp. 1-3.

Allen, F., and Santomero, M., A. (1996). The Theory of Financial Intermediation, Center for Financial Institutions Working Papers 96-32, Wharton School Center for Financial Institutions, University of Pennsylvania.

Allen, F., Carllet, E. and Marquez, R. (2011). 'Credit market competition and capital regulation', Review of Financial Studies, Vol. 24, pp.983-1018.

Allen, F., and Gale, D. (2003). Bank Concentration and Competition, *Journal of Money, Credit, and Banking*, Vol. 36, pp. 453–80.

Allen, F., and Gale, D. (2004). Competition and Financial Stability, *Journal of Money, Credit, and Banking*, Vol. 36, pp. 453–80.

AL-Omar, H. and AL-Mutairi, A. (2008). 'Bank-Specific Determinants of Profitability: The case of Kuwait'. *Journal of Economics and Administrative Sciences*, Vol. 24, no. 2, pp. 20- 34.

Anginer, D., Demirgüç-Kunt, A., and Zhu. 2012. How Does Bank Competition Affect Systemic Stability? Policy Research Working Paper, no. 5981, World Bank, Washington, DC.

Anginer, D., Demirguc-Kunt, A., and Zhu, M. (2014). 'How Does Bank Competition Affect Systematic Stability'? *Journal of Financial Intermediation*, Vol. 23, no. 1, pp. 1-130.

Antanasoglou, P., Delis, M.D. and Cristos, S. (2008). 'Nanking specific industry-specific and macroeconomic determinants of bank profitability.' *International financial markets institutions and money*, Vol. 29, no. 8, pp. 121-136.

Arjan, T., (2010). Market concentration in the banking sector: Evidence from Albania, BERG Working Paper Series on Government and Growth, No. 73, ISBN 978-3-931052-81-2, Bamberg University, Bamberg Economic Research Group on Government and Growth (BERG), Bamberg.

Ashraf, D., Ramady, M., and Albinali, K. (2016). Financial fragility of banks, ownership structure, and income diversification: Empirical evidence from the GCC region. *Research in International Business and Finance*, Vol: 38, pp. 56-68.

Aysan, A. F., and Ceyhan, S. P. (2008). What determines the banking sector's performance in globalized financial markets? The case of Turkey. Physica. A: Statistical Mechanics and Its Applications, Vol. 387, no.7, pp. 1593–1602.

Bain, J. S. (2012). 'Relation of Profit Rate to Industry Concentration,' *Quarterly Journal of Economics*, Vol. 80, pp. 293-324.

Bank for International Settlements, (1997). Financial stability in emerging market economies. Basel (www.bis.org/publ/gten02.pdf).

Barth, J., Caprio, G., and Levine, R. (2004). Bank regulation and supervision: what works best? *Journal of Financial Intermediation*, Vol. 13, pp. 205-248.

Barth, J., Caprio, G., and Levine, R. (2007). Bank regulation and supervision (update June 2008), World Bank Survey III.

Beck, T., Demirgüç-Kunt, A., and Levine, R. (2000). A new database on financial development and structure, *World Bank Economic Review*, Vol. 14, pp. 597 – 605.

Beck, T., Demirguc - Kunt, A., and Levine, R. (2006). Bank concentration, competition, and crises: first results. *Journal for Bank Finance*, Vol. 30, pp. 1581–1603.

Beck, T, Asli Demirgüç-Kunt, A., and Levine, R. (2007). Finance, Inequality and the Poor, *Journal of Economic Growth*, Vol. 12, no. 1, pp. 27–49.

Beck, T. (2008). Bank competition and Financial Stability: Friends or Foes? World bank policy research working paper, no. 4656.

Beck, T., Demirgüç-Kunt A., and Levine R, (2010), " Financial Institutions and Markets across Countries and over Time: The Updated Financial Development and Structure Database" World Bank Economic Review Vol. 24(1), pp.77-92.

Berger, A. N., Demirgüç-Kunt, A., Levine, R., and Haubrich, J. G. (2004). Bank Concentration and Competition: An Evolution in the Making. *Journal of Money, Credit and Banking, Vol.* 36, no. 3, pp. 433-451.

Berger, A. N., and Humphrey, D. B. (1997). The efficiency of financial institutions: International survey and directions for future research *European Journal of Operational Research,* Vol. 98, pp. 175-212.

Berger, A., Demirgüç-Kunt, A., Levine, R. and Haubrich, J. (2004). Bank concentration and competition: an evolution in the making, *Journal of Money, Credit and Banking*, Vol. 36, no. 3.

Berger, A., Klapper, L. and Turk-Ariss, R. (2008). Bank Competition and Financial Stability, Worldbank policy research working paper, no. 4696.

Berger, A. N., Klapper, L. F., and Turk-Ariss, R. (2009). Bank Competition and Financial Stability. *Journal of Financial Services Research,* Vol. 352, pp. 99-118.

Bhatti, G. A. and Hussain, H. (2010) 'Evidence on structure conduct performance hypothesis in Pakistani commercial banks', *International Journal of Business and Management*, Vol. 5, pp. 174–187.

Bikker, J., A., and Groeneveld, J., M., (1998). Competition and Concentration in the EU Banking Industry, Vol. 8. Amsterdam: De Nederlandsche Bank, NV.

Bikker, J. A. and Groeneveld, J. M. (2000). Competition in the EU Banking Industry', Kredit and Kapital, Vol. 33, pp. 62- 98.

Biker, J. A. and Haaf, K. (2002). Competition and Concentration and their Relationship: An Empirical Analysis of the Banking Industry', Journal of Banking and Finance, Vol. 26, pp. 2191-2214.

Bikker, J., A. and Haaf, K., (2002). 'Measures of competition and concentration in the banking industry: A review of the literature', Central Bank of the Netherlands, Economic and Financial Modelling, Summer: 2002.

Bikker, J. A. and Haaf, K. (2003). 'Measures of Competition and Concentration in the Banking Industry: A Review of the Literature, Economic and Financial Modelling (Summer).

Bikker, J. (2006). Misspecification in the Panzar-Rosse model: Assessing completion in the banking industry, DNB working paper, no. 114.

Bikker, J.A., S. Shaefer and L. Spierdijk (2009). The Panzar Rosse Revenue Test: To Scale or Not to Scale., 22nd Australasian Finance and Banking Conference, 21 August.

Bikker, J.A., Shaefer, S., and Spierdijk, L., (2012). Assessing Competition with the Panzar-Rosse Model: The Role of Scale, Costs, and Equilibrium. Forthcoming, Review of Economics and Statistics.

Bodie, Z. and Merton, R. (2005). Design of financial systems: towards a synthesis of functions and structure, Journal of Investment Management, Vol. 3, no. 1, pp. 1-23

Boone, J., (2001). 'Intensity of Competition and the Incentive to Innovate.' International *Journal of Industrial Organizatio*n, Vol. 19, p. 705–26.

Boone, J., Griffith, R., and Harisson, R. (2005), Measuring competition, AIM Research Working Papers Series, 22-August-2005.

Boone, J. (2008). 'A new way to measure competition. *The Economic Journal*,' Vol. 118, pp. 531, pp. 1245–1261.

Boot, A. (2000), 'Relationship banking: what do we know? Journal of Financial Intermediation,' Vol. 9, pp. 7-25.

Boyd, J. H., and Runkle, D. E. (1993). 'Size and performance of banking firms', *Journal of Monetary Economics,* Vol: 31, pp. 47-67.

Boyd, J., and De Nicolo, G. (2002). "Bank Risk-Taking and Competition Revisited." Working Paper, Carlson School of Management, University of Minnesota.

Boyd, J., and De Nicolo, G. (2005), 'The Theory of Bank Risk-Taking Revisited', *Journal of Finance*, Vol. 60, no. 3, pp. 1329–1343.

Boyd, J.H., De Nicolo, G., and Jalal, A.M. (2009). 'Bank Competition, Risk and Asset Allocations', IMF Working Paper 09, no. 143.

Bresnahan, T. F. (2012). 'Empirical Studies of Industries with Market Power', in R. Schmalensee and R. D. Willing (eds), Handbook of Industrial Organisation, Vol. 3, Amsterdam, Elsevier, pp. 1350-1410.

Boyd, John, and David Runkle (1993). 'Size and Performance of Banking Firms: Testing the Predictions of Theory,*' Journal of Monetary Economics*, Vol. 31, pp. 47–67.

Bushman, R. M., Hendricks, B. E., and Williams, C. D. (2016). 'Bank Competition: Measurement, Decision-Making, and Risk-Taking.' *Journal of Accounting Research*, 54(3), 777-826. doi:10.1111/1475-679x.12117.

Caminal, R. and Matutes, C. (2002). 'Market power and banking failures,' *International Journal of Industrial Organization*, Vol. 20, pp. 1341-1361.

Carbó, S. *et al.* (2009). 'Cross-Country Comparisons of Competition and Pricing Power in European Banking'. *Journal of International Money and Finance,* Vol. 28, no1, pp.115-134.

Carletti, E., and Hartmann, P. (2003). 'Competition and Financial Stability: What's Special about Banking?' In Monetary History, Exchange Rates and Financial Markets: Essays in Honour of Charles Goodhart, Vol. 2, edited by P. Mizen. Cheltenham, UK: Edward Elgar.

Carter M. (1989). 'Financial innovation and financial fragility,' *Journal of Economic Issues*, Vol. 23, pp. 779-79.

Chen, X. (2007). 'Banking deregulation and credit risk: evidence from the EU', Journal of Financial Stability, Vol. 2, pp.356 -390.

Čihák, Martin. 2007. "Systemic Loss: A Measure of Financial Stability", *Czech Journal of Economics and Finance*, Vol 57, no 1-2: pp.5-26.

Čihák, Martin, and Heiko Hesse. (2010). 'Islamic Banks and Financial Stability: An Empirical Analysis', Journal of Financial Services Research, 38, no 2-3): pp. 95–113.

Čihák, M., Asli Demirgüç-Kunt, Erik Feyen, and Ross Levine. (2012). 'Benchmarking Financial Development Around the World.' Policy Research Working Paper 6175, World Bank, Washington, DC.

Cihák, M., and Schaeck, K. (2010). 'How well do aggregate prudential ratios identify banking system problems?' *Journal of Financial Stability*, 6, no 3: pp. 130-144.

Cihak, M. *et al.* (2006). Are More Competitive Banking Systems More Stable? IMF Working Papers Vol 06/143, International Monetary Fund.

Chen, X. (2007). 'Banking deregulation and credit risk: evidence from the EU', *Journal of Financial Stability*, Vol. 2, pp.356 -390.

Claessens, S., and Laeven, L. (2004). What Drives Bank Competition? Some International Evidence. *Journal of Money, Credit, and Banking*, *36*(3), 563-583.

Consultancy SA (2019). South African Banking Sector at Lowest Point Since Global Financial Crisis. News 24.

Demirgüç-Kunt, A., and Detragiache, E. (1998). *The Determinants of Banking Crises in Developing and Developed Countries* International Monetary Fund Staff Papers, (1, 45).

Demirguc-Kunt, A. and Levine, R. (2000). Bank concentration: Cross-country evidence. World Bank. [Online] Available at: http://wwwwds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2004/02/10/000265513_20040210165243/ additional/310436360_20050276035212.pdf. Accessed: 24 May 2020.

Demirgüç-Kunt, A., and Detragiache, E. (2002). 'Does deposit insurance increase banking system stability?' An empirical investigation. *Journal of Monetary Economics*, no. 49, pp. 1373-1406.

Demirgüç-Kunt, A., and Enrica Detragiache, (1997). 'The Determinants of Banking Crises in Developing and Developed Countries,' IMF Staff Papers, no. 45, pp. 81–109.

Demirgüç-Kunt, A., Enrica Detragiache, and Tressel, T. (2008). 'Banking on the Principles: Compliance with Basel Core Principles and Bank Soundness,' *Journal of Financial Intermediation*, 17, no. 4, pp. 511–42.

D'Arista, J. (2009). Financial Concentration, Working Paper 3. Massachusetts: Political Economy Research Institute (PERI), University of Massachusetts. [Online] Available at: http://www.peri.umass.edu/fileadmin/pdf/conference_papers/SAFER/DArista_Financial_Concentration.pdf. Accessed: 5 May 2020.

Demirguc-Kunt, A. and Levine, R., (2005). Bank Concentration and Fragility: Impact and Mechanics. [Online]. Available at: http://www.nber.org/chapters/c9610.pdf. Accessed:

23 January 2021.

Demirguc-Kunt, A., and Martinez-Peria, M. S. (2010). *A Framework for Analysing Competition in the Banking Sector: An Application to the Case of Jordan*. Policy Research Working Paper no. 5499.

De Nicolo, G., and Loukoianova, E. (2007). *Bank Ownership, Market Structure, and Risk*. IMF Working papers no. 07/215.

De Jonghe, O., and Vennet, R.V. (2008). 'Competition Versus Efficiency: What Drives Franchise Values in European Banking'? *Journal of Banking and Finance*, Vol. 32, no. 9, pp. 1820-1835.

Deutsche Bundesbank (2016). Financial Stability Review. November. Frankfurt.

Deutsche Bundesbank (2017). Financial Stability Review. November. Frankfurt.

Evanoff, D. D. and Frontier, D. L. (2010). 'Re-evaluation of Structure-Conduct Performance Paradigm in Banking', *Journal of Financial Services Research*, Vol. 6, pp. 377-498.

Falkena, H. B. (2004). The Access and Stability objectives of regulation. Workshop on tiered banking legislation at the South African Reserve Bank Conference Centre, Pretoria, 22 November.

Falkena, H. I., Abedian, M., Von Blottnitz, C., Coovadia, G., Davel, J., Madungandaba, E., Masilela, S., and Rees, (2001). SMEs access to finance in South Africa: A supply-side regulatory review. Johannesburg.

Falkena, H., Davel, G., Hawkins, P., Llewellyn, D., Luus, C., Masilela, E., Parr, G., Pienaar, J., and Shaw, H. (2004). Competition in South African Banking. Task Group Report for the National Treasury and the South African Reserve Bank, April. [Online] Available at http:// citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.732.2716andrep=rep1andtype=pdf [Accessed: 23 December 2020].

Fernández de Guevara, J., Maudos, J., and Pérez, F. (2007). Integration and competition in the European financial markets. *Journal of International Money and Finance,* Vol. 26, no. 1, 26-45.

Fernandez, R. O., and Garza-Garciab, J. G. (2012). *The relationship between bank competition and financial stability: A case study of the Mexican banking industry*. Centre for Global Finance Working Paper no. 03/12.

Fu, X., Lin, Y., and Molyneux, P. (2014). Bank competition and financial stability in the Asia Pacific. *Journal of Banking and Finance,* Vol. 38, pp. 64-77.

Goddard, J. A., Molyneux, P., and Wilson, J. O. S. (2001). European Banking. Efficiency, Technology and Growth, London, Wiley.

Goddard, J., and Wilson, J. O. S. (2009). Competition in banking: A disequilibrium approach. *Journal of Banking and Finance,* Vol. 33, no. 12, pp. 2282-2292.

Hamza, R.A. (2011). Validation Panzar-Rosse model in determining the structural characteristics of the Tunisian banking industry. *Journal of Economics and International Finance,* Vol. 3, no. 5, pp. 259-268.

Haaf, K. and Biker, J. A. (2002). Competition and Concentration and Their Relationship: An Empirical Analysis of the Banking Industry', *Journal of Banking and Finance,* Vol. 26, pp. 2191-2214.

Hicks, J. (2008). 'The Theory of Monopoly', Econometrica, Vol. 6, pp. 15-30.

Ho, T. S. Y., Saunders A. (1981). The Determinants of Bank Interest Margins: Theory and Empirical Evidence, Journal of Financial and Quantitative Analysis, Cambridge University Press, Vol. 16, no. 04, pp. 581-600.

Hou, X. Wang, and Zhang, Q. (2014). 'Market structure, Risk-taking, and the Efficiency of Chinese Commercial Banks', Emerging Markets Review, Vol. 20, pp. 75- 78.

Hope, C.J., Gwatidzo, T., and Ntuli, M. (2013). 'Investigating the effect of bank competition on financial stability in ten African countries', *International Business and Economic Research Journal*, Vol. 12, pp. 755-769.

IMF (International Monetary Fund), (2004). Indicators of Financial Structure, Development, and Soundness, Financial Sector Assessment: A Handbook (Chapter 2). [Online] Available at: http://www.imf.org/external/ pubs/ft/fsa/eng/pdf/ch02.pdf. Accessed: 23 July 2016.

IMF (International Monetary Fund), (2013). Dancing together? Spill-overs, common shocks, and the role of financial and trade linkages. World Economic Outlook: Transitions and

Tensions (Chapter 3). [Online] Available at: https://www.imf.org/external/pubs/ft/ weo/2013/ 02/ pdf/c3.pdf. [Accessed: 02 February 2021].

IMF and World Bank, (2005). Financial Sector Assessment: A Handbook. New York: World Bank Publications.

Iwata, G. (1974). Measurement of conjectural variations in oligopoly. Econometrica*: Journal of the Econometric Society*, pp. 947–966.

Iveta, R., (2012). Market Power in the Czech Banking Sector. Vol. 4, Issue 1, pp. 143-155.

Jiménez, G., Lopez, J. A., and Saurina, J. (2013).

'How does competition affect bank risk-taking?' *Journal of Financial Stability,* Vol, 9, no. 2, pp. 185-195.

Kamau, A. and Weir, M. (2013) 'What drives banking sector performance in Kenya?' *Global Business and Economics Research Journal*, Vol. 2, pp. 45–59.

Kaminsky, Graciela, and Carmen Reinhart, (1999). 'The Twin Crises: The Causes of Banking and Balance of Payments Problems,' The American Economic Review, Vol. 89, no3, pp. 473–500.

Kassim, H. (2010). Does bank concentration increase credit risk-taking behaviour? Evidence from SADC. [Online] Available at: http://search.proquest.com/science/openview/8b2a 3372e11703ea313884723bac843a/. [Accessed: 2 July 2016].

Keeley, M. C. (1990). 'Deposit insurance, risk, and market power in banking'. The American economic review, pp. 1183-1200.

Knight, F.K. (1921). Risk, Uncertainty and Profit, Chicago, University of Chicago Press.

Kosmidou, K., Pasiouras, F., Doumpos, M. and Zopounidis, C. (2006). 'Assessing performance factors in the UK banking sector: a multicriteria methodology.' *Central European Journal of Operations Research*, Vol. 14, no. 1, pp. 25-44.

Leon, F. (2014). Measuring competition in banking: A critical review of methods. France.

Leon, F. (2015). 'Does Bank Competition Alleviate Credit Constraints in Developing Countries'. *Journal of Banking and Finance*, Vol (57), pp.130–142.

Lerner, A. P. (2012). 'The Concept of Monopoly and the Measurement of Monopoly Power', Review of Economic Studies, Vol. 1, pp. 180-200.

Levine, R. (2004). Finance and growth: theory and practice, NBER Working paper no. W10776

Liebenstein, H. (2009). 'Allocative Efficiency versus X-Efficiency', American Economic Review, Vol. 56, pp. 392-415.

Liu, H., and Wilson, J. O. (2013). 'Competition and risk in Japanese banking'. *The European Journal of Finance*, Vol 19(1), pp.1-18.

Liu, H., Molyneux, P., and Wilson, J. O. (2013). Competition and Stability in European Banking: A Regional Analysis. The Manchester School, Vol. 812, pp. 176-201.

Kassim, H. (2010). Does bank concentration increase credit risk-taking behaviour? Evidence from SADC. [Online] Available at: http://search.proquest.com/science/openview/8b2a 3372e11703ea313884723bac843a/. Accessed: 2 July 2016.

Macit, F. (2012). Recent evidence on concentration and competition in the Turkish banking sector. Theoretical and Applied Economics, Vol. 8, no. 8, pp. 19.

Marcus, A. J. (1984). 'Deregulation and bank financial policy'. *Journal of Banking and Finance*, Vol. 8, no, 4, pp. 557-565.

Martinez-Miera, D., and Repullo, R. (2010). 'Does competition reduce the risk of bank failure?' Review of Financial Studies, Vol 23, no. 10, pp. 3638-3664.

Masood, M. and Ashraf, M. (2012). Bank-Specific and macroeconomic profitability determinants of Islamic banks: The case of different countries.' Qualitative Research in Financial Markets, Vol. 4, no. 2, pp. 255- 268.

Mlambo, K., and Ncube, M. (2011). 'Competition and Efficiency in the Banking Sector in South Africa'. African Development Review, Vol. 23, pp. 4-15.

Molyneux, P., Lloyd-Williams, D. M. and Thornton, J. (2001). 'Competitive Conditions in African Banking', *Journal of Banking and Finance*, Vol.18, pp. 445-459.

Mullineux A.V. (1990). Business Cycles and Financial Crises, Hemel Hempstead, Harver ster Wheatsheaf.

Mohr, P. (2011). *Economic Indicators Economic Indicators*. 4th ed. South Africa: Unisa Press.

Ncube, M. (2009). The efficiency of the banking sector in South Africa. University of the Witwatersrand, South Africa.

Ncube, M. (2009). The efficiency of the Banking Sector in South Africa, African Economic Conference 2009 Fostering Development in an Era of Financial and Economic Crises, Addis Ababa.

Norden, L., Buston, C. S. and Wagner, W. (2014). 'Financial Innovation and Bank Behaviour: Evidence from credit markets, *Journal of Economic Dynamics and Control*, Vol. 43, pp. 130-145.

Organisation for Economic Cooperation and Development, (2010). Competition, concentration, and stability in the banking sector. DAF/COMP2010. [Online] Available at: www. oecd.org/competition/sectors/46040053.pdf. [Accessed: 4 May 2020].

Okeahalam, C., C., (2002). Concentration in the banking sector of the common monetary area of Southern Africa. Presented as development issues at the New Economy Conference, Cape Town, University of Cape Town, March 24–26. [Online] Available at: http:// siteresources.worldbank.org/INTFR/Resources/4754591107888557402/Bank_Concentration _in_the_Common_Monetary_Area_of_South_Africa.pdf. [Accessed: 01 February 2021].

Panzar, J., and Rosse, J., (1982). "Structure, Conduct and Comparative Statistics." Bell Laboratories Economic Discussion Paper No. 248. Bell Labs Statistics Research Department, Murray Hill, NJ.

Panzar, J. C. (1987). 'Testing for Monopoly Equilibrium', *Journal of Industrial Economics*, Vol. 35, pp. 443-456.

Perera, S., Skully, M. and Chaudhry, Z. (2013). Determinants of commercial bank profitability: South African evidence. South African of Finance and Accounting, Vol. 5 no.51, pp. 365- 380.

Petersen, M., and Rajan, R. (1997). 'The effect of credit market competition and lending relationships', *The Quarterly Journal of Economics*, Vol. 110, pp. 407-443.

Reinhart, C. and Rogoff, K. (2009a). This time is different: A panoramic view of eight centuries of financial crises, Princeton: Princeton University Press.

Reinhart, C. and Rogoff, K. (2009b). 'The aftermath of financial crises', American Economic Review, Vol. 99, no. 2, pp. 466-472.

Schaeck, K., Cihak, M., and Wolfe, S. (2006). Are more competitive banking systems more stable? Unpublished Working Paper No. 143, International Monetary Fund, Washington, D.C.

Schaeck, K., Cihak, M., and Wolfe, S. (2009). 'Are competitive banking systems more stable'? *Journal of Money, Credit and Banking*, Vol. 41, 4, pp. 711-734.

Schaeck, K., and Cihák, M. (2014). Competition, efficiency, and stability in banking. Financial Management, Vol. 43, no. 1, pp. 215-241.

Schumpeter, J. A. (1942). Capitalism, Socialism and Democracy, Harper and Row, New York, NY, USA.

Shaffer, S. (2004). 'Pattern of Competition in Banking'. *Journal of Economics and Business*, Vol. 56, pp. 287-313.

Shepherd, W. (1984). 'Contestability' vs. 'Competition,' American Economic Review, Vol. 74, no. 4, pp. 572-87.

Simatele, M. (2015). Market structure and competition in the South African Banking sector. Procedia Economics and Finance, Vol. 30, pp. 825 – 835.

Simbanegavi W., Greenberg J.B., and Gwatidzo T. (2015). 'Testing for Competition in the South African Banking Sector'. *Journal of African Economics*, Vol. 24, pp.3 03-324.

Simbanegavi, W., and Rapapali, M. (2020). Competition in South African Banking: An assessment using the Boone Indicator and Panzar–Rosse approaches. South African Reserve Bank Working Paper Series WP/20/02.

Smirlock, M. (2008). 'Evidence on the (Non) Relationship between Concentration and Profitability,' *Journal of Money, Credit and Banking*, Vol. 22, No. 6, pp. 89-103.

Saunders, A. and Schumacher, L. (2000). The determinants of bank interest rate margins: an international study, *Journal of International Money and Finance*, Vol. 1, no.6, pp. 813-832.

South African Reserve Bank (2008). Financial Stability Review, Pretoria: South African Reserve Bank. [Online] Available on http://www.reservebank.co.za/ [accessed: 15 March 2019].

South African Reserve Bank (2009). Annual Report 2009, Bank Supervision Department Statistical Society, Series A (General), Vol. 120, pp. 253–78.

South African Reserve Bank (2019). South Africa's Biggest Banks Still Dominate Despite Competition. Business Tech.

Spierdijk, L., and Zaouras, M. (2016). The Lerner index and revenue maximization. *Applied Economics Letters*, pp. 2415, pp. 1075-1079.

Stiglitz, J.E., and Weiss, A. (1981). Credit rationing in markets with imperfect information. Am Econ Rev, Vol. 71, pp. 393– 410.

Syden Mishi and Sibanisezwe Alwyn Khumalo (2019). Bank stability in South Africa: what matters? Banks and Bank Systems, Vol. 141, pp. 122-136.

Tabak, B.M., Fazio, D.M., and Cajueiro, D.O. (2012). 'The relationship between banking market competition and risk-taking: Do size and capitalization matter'? *Journal of Banking and Finance*, Vol 36, no.12, pp. 3366-3381.

Tan, Y. and Floros, C. (2014). 'Risk, profitability, and competition: evidence from the Chinese banking industry, *The Journal of Developing Areas*, Vol. 48, pp. 303- 319.

Uddin, S. S. and Suzuki, Y. (2014). 'The Impact of Competition on performance in Bangladesh: an empirical study,' *International Journal of Financial Services Management*, Vol. 7, pp. 73- 94.

World Bank (2006). Doing business. The World Bank, Washington, D.C.

World Bank South Africa country Brief [Online] Available on http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/SOUTHAFRICAEXTN [Accessed 24 February 2019].

World Bank (2012). Global Financial Development Report 2013: Rethinking the Role of the State in Finance. World Bank, Washington, DC (https://www.worldbank.org/en/publication/gfdr), Chapter 3.

Yeyati, E. L., and Micco, A. (2007). 'Concentration and foreign penetration in Latin American banking sectors: Impact on competition and risk,' *Journal of Banking and Finance*, Vol. 316, pp. 1633-1647.

Zigraiova, D., and Havranek, T. (2016). 'Bank Competition and Financial Stability: Much Ado About Nothing?' *Journal of Economic Surveys*, Vol. 30, no. 5, pp. 944-981.

Zhou, K., and Wong M. C. S. (2008). The Determinants of Net Interest Margins of Commercial Banks in Mainland China, Emerging Markets Finance and Trade, Vol. 44, no, 5, pp. 41-53.

.

APPENDIX

Appendix A: Revenue Logarithms Regression Results

Absa regression table

Source	SS	df	MS	Number of obs	=	8
				F(6, 1)	=	154.88
Model	.54393636	6	.09065606	Prob > F	=	0.0614
Residual	.000585338	1	.000585338	R-squared	=	0.9989
				Adj R-squared	=	0.9925
Total	.544521698	7	.077788814	Root MSE	=	.02419

lnAbsarev	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnAbsacad	.1686582	.0922559	1.83	0.319	-1.003564	1.34088
lnAbsaasset	.9142808	.0615627	14.85	0.043	.1320529	1.696509
lnAbsaaota	.809386	.1620549	4.99	0.126	-1.249716	2.868488
lnAbsaafri	-.2652592	.1287961	-2.06	0.288	-1.901769	1.371251
lnAbsaea	-.025097	.2700418	-0.09	0.941	-3.456303	3.406109
lnAbsalo	-.0072466	.0117843	-0.61	0.649	-.1569805	.1424873
_cons	.5084143	1.315472	0.39	0.765	-16.20624	17.22307

Source: Regressed by the author using Stata (2021)

Capitec logarithm regression Results

Source	SS	df	MS	Number of obs	=	14
				F(6, 7)	=	15077.23
Model	13.938979	6	2.32316316	Prob > F	=	0.0000
Residual	.001078589	7	.000154084	R-squared	=	0.9999
				Adj R-squared	=	0.9999
Total	13.9400576	13	1.07231212	Root MSE	=	.01241

lnCaprev	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnCapcad	-.0193478	.0241561	-0.80	0.449	-.0764678	.0377723
lnCapasset	1.061716	.0168334	63.07	0.000	1.021911	1.101521
lnCapaota	.6247759	.20017	3.12	0.017	.1514491	1.098103
lnCapafri	.3555109	.1857837	1.91	0.097	-.0837976	.7948194
lnCapea	-.0774036	.0855154	-0.91	0.395	-.2796154	.1248081
lnCaplo	-.0302532	.009239	-3.27	0.014	-.0520998	-.0084065
_cons	-.6175581	.2227418	-2.77	0.028	-1.144259	-.0908574

Source: Regressed by the author using Stata (2021)

Nedbank Logarithm Regression Results

Source	SS	df	MS	Number of obs	=	13
				F(6, 6)	=	95.65
Model	1.21479006	6	.202465011	Prob > F	=	0.0000
Residual	.012700462	6	.002116744	R-squared	=	0.9897
				Adj R-squared	=	0.9793
Total	1.22749052	12	.102290877	Root MSE	=	.04601

lnNedrev	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnNedcad	.0365282	.0583373	0.63	0.554	-.1062181	.1792746
lnNedasset	.8121032	.1343609	6.04	0.001	.483334	1.140872
lnNedaota	-2.393777	2.587666	-0.93	0.391	-8.725566	3.938013
lnNedafri	2.872247	2.499666	1.15	0.294	-3.244214	8.988709
lnNedea	.9304255	.6342406	1.47	0.193	-.6215055	2.482356
lnNedlo	-.0017585	.0234638	-0.07	0.943	-.0591723	.0556553
_cons	3.079174	2.075566	1.48	0.188	-1.999553	8.1579

Source: Source: Regressed by the author using Stata (2021)

First Rand Bank Logarithm Regression Results

Source	SS	df	MS	Number of obs	=	10
				F(6, 3)	=	12635.36
Model	2.09680011	6	.349466685	Prob > F	=	0.0000
Residual	.000082973	3	.000027658	R-squared	=	1.0000
				Adj R-squared	=	0.9999
Total	2.09688308	9	.232987009	Root MSE	=	.00526

lnFNBrev	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnFNBcad	.1891828	.0253963	7.45	0.005	.1083605	.2700052
lnFNBasset	1.101158	.0202859	54.28	0.000	1.0366	1.165717
lnFNBaota	-.2979358	.1445054	-2.06	0.131	-.7578163	.1619447
lnFNBafri	.9755044	.1431173	6.82	0.006	.5200412	1.430968
lnFNBea	.1720625	.0572481	3.01	0.057	-.0101264	.3542515
lnFNBlo	-.0168695	.004658	-3.62	0.036	-.0316934	-.0020457
_cons	-1.385038	.3894317	-3.56	0.038	-2.624384	-.1456928

Source: Source: Regressed by the author using Stata (2021)

Bank Logarithm Regression Results

Source	SS	df	MS	Number of obs	=	8
				F(6, 1)	=	266.14
Model	.873324885	6	.145554147	Prob > F	=	0.0469
Residual	.000546902	1	.000546902	R-squared	=	0.9994
				Adj R-squared	=	0.9956
Total	.873871787	7	.124838827	Root MSE	=	.02339

lnSBKrev	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnSBKcad	.3736349	.2327383	1.61	0.355	-2.583586	3.330855
lnSBKasset	.9429641	.0703784	13.40	0.047	.0487216	1.837207
lnSBKaota	.9629373	.4103061	2.35	0.256	-4.250496	6.17637
lnSBKafri	-.1830713	.292717	-0.63	0.644	-3.902393	3.53625
lnSBKea	-.3196861	.2585161	-1.24	0.433	-3.604445	2.965073
lnSBKlo	.0103344	.0105813	0.98	0.508	-.1241138	.1447827
_cons	.8016936	.7116283	1.13	0.462	-8.240401	9.843788

Source: Source: Regressed by the author using Stata (2021)

Appendix D: Marginal Cost Logarithm of Absa Regressions

Reg lnAbsaTA lnAbsaCol lnAbsaCoBF

Source	SS	df	MS	Number of obs	=	14
				F(3, 10)	=	16.57
Model	.658187497	3	.219395832	Prob > F	=	0.0003
Residual	.132434858	10	.013243486	R-squared	=	0.8325
				Adj R-squared	=	0.7822
Total	.790622356	13	.060817104	Root MSE	=	.11508

lnAbsaTA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnAbsaCol	-.2438625	.2923537	-0.83	0.424	-.895267	.4075421
lnAbsaCoPC	-1.12517	.3884537	-2.90	0.016	-1.990699	-.2596415
lnAbsaCoBF	.1533832	.1534173	1.00	0.341	-.1884518	.4952181
_cons	14.40487	1.025428	14.05	0.000	12.12007	16.68966

Source: Author's regression using Stata (2021)

Reg lnFNBTA lnFNBCol lnFNBCoPC lnFnbCoBF

Source	SS	df	MS	Number of obs	=	14
				F(3, 10)	=	16.37
Model	1.43622671	3	.478742237	Prob > F	=	0.0003
Residual	.292393512	10	.029239351	R-squared	=	0.8309
				Adj R-squared	=	0.7801
Total	1.72862022	13	.132970786	Root MSE	=	.171

lnFNBTA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnFNBCoL	-.0221655	.1341807	-0.17	0.872	-.3211388	.2768078
lnFNBCoPC	1.367662	.2756746	4.96	0.001	.7534208	1.981903
lnFNBCoBF	.58545	.1028244	5.69	0.000	.356343	.814557
_cons	13.47964	.5522206	24.41	0.000	12.24922	14.71006

Source: Author's regression using Stata (2021)

Reg lnNedTA lnNedCol lnNedCoPC lnCoBF

Source	SS	df	MS	Number of obs	=	14
				F(3, 10)	=	4.60
Model	.653066699	3	.2176889	Prob > F	=	0.0286
Residual	.473505541	10	.047350554	R-squared	=	0.5797
				Adj R-squared	=	0.4536
Total	1.12657224	13	.086659403	Root MSE	=	.2176

lnNedTA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnNedCoL	2.457794	.7159415	3.43	0.006	.8625772	4.053011
lnNedCoPC	-1.550483	.6995536	-2.22	0.051	-3.109185	.00822
lnNedCoBF	.5186907	.5458317	0.95	0.364	-.6974982	1.734879
_cons	26.67961	4.287457	6.22	0.000	17.12656	36.23266

Source: Author's regression using Stata (2021)

Reg lnCapTA lnCapCol lnCoPC lnCoBF

Source	SS	df	MS	Number of obs	=	10
				F(3, 6)	=	22.69
Model	5.0354367	3	1.6784789	Prob > F	=	0.0011
Residual	.443892088	6	.073982015	R-squared	=	0.9190
				Adj R-squared	=	0.8785
Total	5.47932878	9	.608814309	Root MSE	=	.272

lnCapTA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnCapCoL	-2.382693	.4299079	-5.54	0.001	-3.43464	-1.330747
lnCapCoPC	.0443933	1.291676	0.03	0.974	-3.116223	3.20501
lnCapCoBF	1.22579	.5918248	2.07	0.084	-.222353	2.673933
_cons	6.089511	2.598475	2.34	0.058	-.268728	12.44775

Source: Author's regression using Stata (2021)

Reg lnSBKTA lnSBKCol lnSBKCoPC lnSBKCBF

Source	SS	df	MS	Number of obs	=	14
				F(3, 10)	=	3.31
Model	.739593394	3	.246531131	Prob > F	=	0.0656
Residual	.744997825	10	.074499783	R-squared	=	0.4982
				Adj R-squared	=	0.3476
Total	1.48459122	13	.114199325	Root MSE	=	.27295

lnSBKTA	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnSBKCoL	.2160879	.6633078	0.33	0.751	-1.261854	1.69403
lnSBKCoPC	-.5176997	.3501538	-1.48	0.170	-1.297891	.2624916
lnSBKCBF	.9279022	.3259058	2.85	0.017	.2017389	1.654066
_cons	17.73819	2.802286	6.33	0.000	11.49431	23.98207

Source: Author's regression using Stata (2021)

Ethical Clearance

21 April 2021

Mr Mzamo Perceviere Vilakazi (210552512)
School Of Acc Economics&Fin
Westville

Dear Mr Mzamo Perceviere Vilakazi,

Protocol reference number: 00011056
Project title: An analysis of bank competition and financial stability: Evidence from the South African banking sector

Exemption from Ethics Review

In response to your application received on 20 April 2021 , your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW.**

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:
Research data should be securely stored in the discipline/department for a period of 5 years.

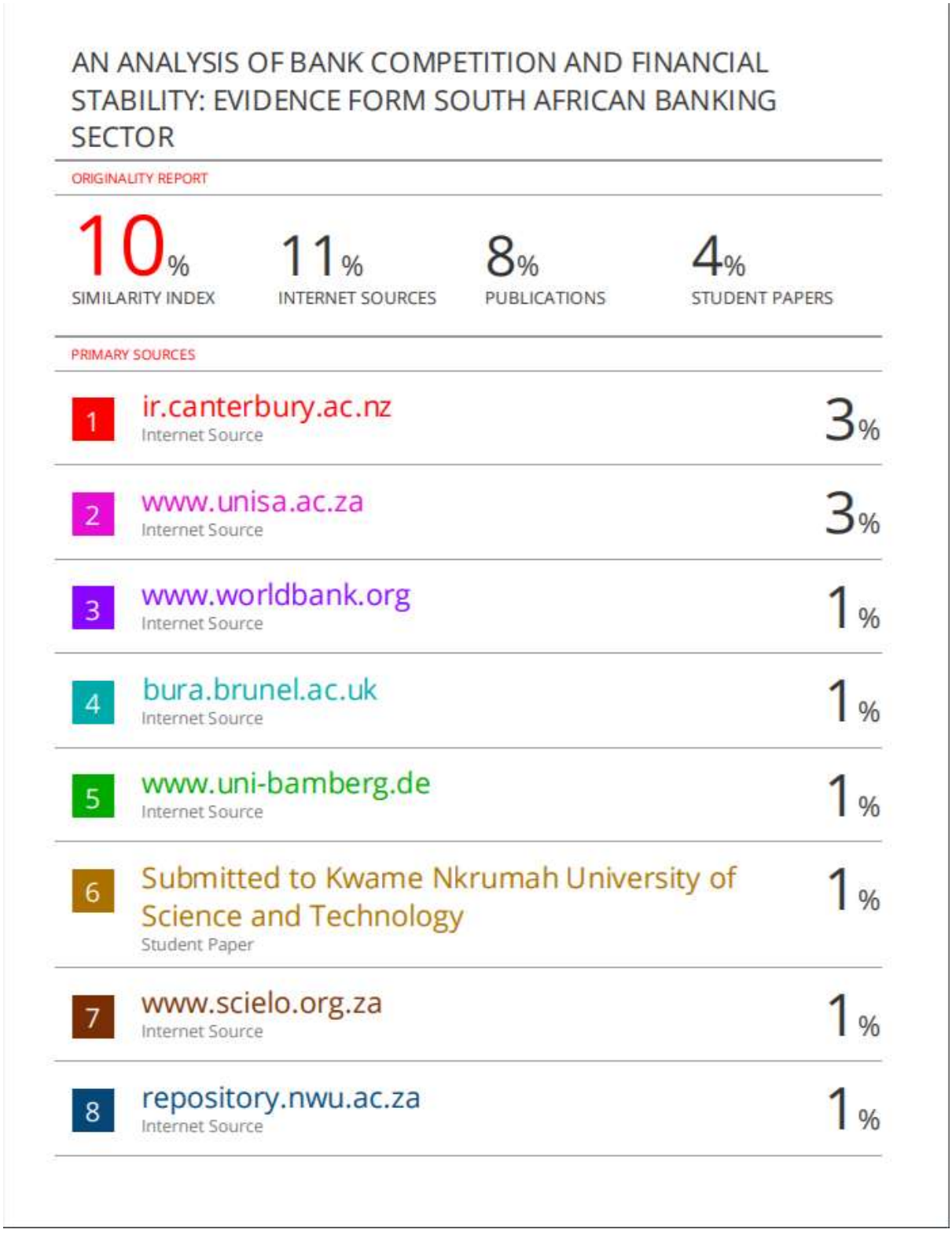
I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,

[redacted] 21 April 2021

Prof Josue Mbonigaba
Academic Leader Research
School Of Acc Economics&Fin

Turnitin Report



AN ANALYSIS OF BANK COMPETITION AND FINANCIAL STABILITY: EVIDENCE FORM SOUTH AFRICAN BANKING SECTOR

ORIGINALITY REPORT

10%	11%	8%	4%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ir.canterbury.ac.nz Internet Source	3%
2	www.unisa.ac.za Internet Source	3%
3	www.worldbank.org Internet Source	1%
4	bura.brunel.ac.uk Internet Source	1%
5	www.uni-bamberg.de Internet Source	1%
6	Submitted to Kwame Nkrumah University of Science and Technology Student Paper	1%
7	www.scielo.org.za Internet Source	1%
8	repository.nwu.ac.za Internet Source	1%