ADDIS ABABA UNIVERSITY
Department of Accounting and Finance

The degree of Competition in Ethiopian Banking Industry

A Thesis Presented in partial Fulfillment of the Requirements for the Degree of Master of Science in Accounting and Finance

Prepared by: Bethelhem Melkamu

February 2018.

Addis Ababa, Ethiopia

STUDENT DECLARATION

I declare that the thesis for the **MSc. degree in accounting and finance** at the University of Addis Ababa, herby submitted by me, is my original work and have not previously been submitted for a degree at this or any other university, and all references materials contained therein have been duly acknowledged.

Name: Bethelhem Melkamu Advisor's Name: Dr. Habtamu Berhanu

Signature: ---------- Signature: ----------

STATEMENT OF CERTIFICATION

This is to certify that the thesis prepared by Bethelhem Melkamu Legesse entitled: *"The degree of Competition in Ethiopian Banking Industry"* submitted in partial fulfillments of the requirements for the Degree of Master of Science in Accounting and Finance complies with the rules and regulations of the university and meets the expected standards with respect of originality and quality.

External Examiner_____**Signature**_____**Date**_____

Internal Examiner _____**Signature** _____**Date**_____

Advisor _____ **Signature** _____ **Date** _____

_____ _____ _____

Graduate Program coordinator signature date

ACKNOWLEDGEMENTS

It is the grace, help and kindness of the almighty God- Jesus Christ that made me achieve this success and strength and to go through all these time.

While there are several people who have helped me in one way or another to achieve the completion of this thesis, it would have not been possible without the guidance, support and expertise of my thesis **Habtamu Berhanu (Dr.).** So, I thank him for his constructive comments and outstanding help with this thesis, for allowing me the complete freedom to pursue this study, to work on my own initiative and for making me to use the potential that I have with confidence on my ability.

Next, I am indebted to Mawek and Kebede who availed me the data and my friend Merima and Zemen who assisted when preparing my thesis.

Lastly, I would like to extend my immense thankfulness to my parents (specially my beloved Husband, **Solomon Addisu**) and friends; and to all who have even a single contribution in this work.

May God bless you!

Abstract

This study tries to investigate competitive condition of Ethiopian banking industry based on 16 private banks using quarterly panel data over the period of 2013-2017. The study applies both structural and non-structural methods. The result of structural measures; Concentration Ratio and Herfindahl-Hirschman index confirm banking sector in Ethiopia moderately concentrated and decreasing from time to time. A modern empirical analysis based on the non-structural method developed by Panzar and Rosse (1987) regressions with fixed effects were used to calculate the H statistic. The H-statistic is estimated using both interest revenue and total revenue as dependant variables. As explanatory variables: three factor input prices, bank specific and macroeconomic control variables used. The result of non-structural model; Panzar-Rosse confirm banking industry operate under perfect competitive and the equilibrium test results confirm that the market is in long-run equilibrium but interest revenue based market is lower than non-interest based market, that is price competition is relatively low in Ethiopian banking sector. The bank revenue highly explained by price of fund than other input prices, that implying interest expense is the main element of variable cost among banks. The result of non-structural model also confirms the structural argument that concentration is not a proxy of market structural.

***Key words**: banking, competition, panzer-Rosse, H-statistic*

List of Tables:

List of Figures:

Title **page No.**

List of Acronyms

AIB	Awash international
BOA	Bank of Abyssinia
CBE	Commercial bank of Ethiopia
CR	Concentration ratio
DB	Dashen bank
GTP II	Growth and transformation plan (second)
HHI	Herfindahl-Hirschman index
NBE	National bank of Ethiopia
PF	Price of fund
PK	Price of capital
PL	Price of labor
ROA	Return on asset
ROE	Return on equity
UB	United bank
WB	Wegagen bank

Contents

Chapter One: Introduction

1.1 Background of the study

Banks are a vital part of a nation's economy; they play a key role in improving efficiency by facilitating the flows of financial assets from several to those with investment and consumption needs. Banks contribute greatly to economic growth by playing an intermediating role between borrowers and lenders and providing financial resources to other industries and hence facilitating production. The banking system is also important since any instability in the banking system has the potential to lead to a financial instability and economic crisis. Hence, a well-functioning banking system is regarded as a cornerstone of a market economy. Policymakers try to ensure that banking system is stable and besides ensure that it is competitive and efficient.

In developing countries, like Ethiopia, a bank-dominated financial sector, when effective and efficient plays a significant role in promoting economic growth.

1.2 Overview of Ethiopian banking industry

Ethiopian banking history started 2000 years ago, during Axumite dynasty. modern banking started in 1905 with establishment of Abyssinia bank and subsequent establishment of development bank called; Societe Nationale d'Ethiope Pour le Development de l'Agriculture et du Commerce) and two other foreign banks (Banque de l'Indochine and the Compagnie de l'Afrique Orientale in 1908 (Geda 2006). Those banks were largely foreign owned and in 1931 the Ethiopian government purchased the Abyssinian Bank, and renamed it the bank of Ethiopia which was the first nationally owned bank on the African. With Italian invasion and occupation between 1936-1941 of 5 years, Italian Banks namely, Banco de Napoli, Banco Naciconale (De's Voro), Casa de Creito, and society Nacional e di Ethiopia operated their branches in Ethiopia. After independency, in 1943 Ethiopian government established the State Bank of Ethiopia and acted both Central bank and Commercial bank until 1963 when it was changed into today's National Bank of Ethiopia (the Central Bank, re-established in 1976) and the Commercial Bank of Ethiopia (CBE), (Geda,2006). After this period many other banks were established and the number of the banks reached nine. However, under the Derge regime (per-reform period, 1975-

1991), all private financial institutions were nationalized. the government restructured the financial system and formed the Agricultural and Industrial bank (AIB), renamed recently as the Development Bank of Ethiopia (DBE) and a Housing and Saving Bank (HSB), renamed recently as the Construction and Business Bank (CBB), AIB was mainly responsible for financing agricultural and industrial projects with medium and long growth period, while HSB used to lend for the construction of residential and commercial buildings. (Geda, 2006).

After the downfall of Derge regime in 1991, economic policy saw a marked change from the previous "socialist". In this period the new government (EPDRF), adopted a market-oriented economic policy. As the same time, the financial sector reformation was made in 1994, enacting of a new Monetary and banking Proclamation No. 83 of 1994, the licensing and supervision of banking business no.84 of 1994 and subsequent financial sector liberalization measures. The banking legislation permitted private investment in the banking sector for Ethiopians which has been totally forbidden during the socialist regime. Following this proclamation the first private commercial bank Awash International bank was established in 1994. Currently, there are 16 private commercial banks, 1 public commercial bank and 1 development bank in operation in Ethiopia.

Ethiopian financial sector mainly consisting of banks, insurance and micro-finance institutions. Through it is a bank dominated financial sector. Recently the bank industry comprises of 18 banks, 16 private commercial banks and 2 government owned banks (1 development bank and 1 public commercial bank).

1.2.1 Banking Sector Regulation in Ethiopia

National bank of Ethiopia is the regulatory body of financial institutions in Ethiopia. The monetary and banking proclamation No.83/1994 which is amended by proclamation No. 591/2008 and banking business proclamation 84/1994 amended bay banking business proclamation No592/2008 has given the national bank of Ethiopia the power and duty to license, supervise and regulate financial institutions. At the result of the two proclamations NBE has issued various directives in different periods with the aim of promoting stability and reducing risk. Classens (2009) suggested including regulatory issue to gauge the level of contestability. The contestability method conceder regulatory issue incorporating; entry barriers, openness of

foreign bank entry, activity restriction, and capital requirements. These are some of the directives related to the issue of contestability;

1.2.1.1 Restriction on Banking Activities

The NBE directive NO.SBB/12/1996 is repealed and replaced by new directives on October 01, 2015. NBE directive NO SBB/60/2015 put the following restriction on the banking business. The bank is not allowed to engage in insurance and non-banking business directly. However, a bank may hold equity shares not exceeding 5% of insurers subscribed capital in a single insurance company and a banks aggregate equity investment in all non-banking business including insurance companies, not exceeding 10% of its net worth banks are prohibited from dealing securities. However, a bank may provide securities brokerage services to its costumer acting as their agent. These prudential measures however considered critical where the financial system is undeveloped, limit the exertion of banks (particularly new contestants) to compete activity, thus dissuading contestability to some degree.

1.2.1.2 Capital Requirement

The National Bank of Ethiopia requires banking to maintain a minimum capital to withstand adverse stock and compete amongst each other. Since the inception of the NBE, the minimum capital requirement for banks has been increased twice. The most recent increase in the capital requirement to 500million birr from its previous level of 75million birr (approximately 56.7%) was issued on September 19, 2011 (NBE Directives NO. SBB/502011). But as per NBE letter addressed all banks, in GTP II strategy plan all banks have to target their capital 2 billion birr until 2020.

1.2.1.3 Reserve Requirement

Like in other jurisdictions, Ethiopian banks are directed to maintain a stipulated percentage of eligible local and foreign currency deposit liabilities, mainly in the form of demand, savings and time deposits with the national bank of Ethiopia. Currently, reserve requirement are kept at 5% (NBE Directive NO SBB/55/2013 6th replacement).

1.2.1.4 Limitation of Foreign Entry on Banking Industry

Regarding foreign ownership of domestic banks, the government clearly restricts foreign nationals or organization to; own banks fully or partially, open banks or branch offices or subsidiaries of foreign bank in Ethiopia or acquire the share of Ethiopian banks. The Ethiopian

government concern is that; firstly, as the banking sector in Ethiopia is young it won't have the capacity to compete with more developed foreign banks, secondly, if foreign banks are allowed to operate, they will focus on the large corporate sectors and provide credit to them while reducing their service to small and starting enterprises, thirdly, foreign banks may focus on lending rather than mobilizing of saving and finally, as present Ethiopia lacks financial experts that design and operate the regulatory structure to supervise the highly advanced foreign banks. However, allowing foreign ownership and permitting foreign banks entry would bring about greater contestability rather than merely legal changes.

1.2.2 Financial sector development

The financial sector in Ethiopia contains formal, semiformal and informal institutions. the formal financial institutions consists of banking industry, insurance company & microfinance institutions, which are regulated and supervised by national bank of Ethiopia. The banking industry accounts for 84% of the total financial sector capital as the end of June 2017, indicates that the financial sector is underdeveloped, and activities that banks could perform are legally limited which in turn contributes to lesser contestability.

The insurance sector in Ethiopia is small and it accounts for just about 5% of the financial sector capitals as of June 2017.the total number of insurance companies and branches increased significantly. As of June 2017, there are 17 insurance companies in operation. Their branches increased to 492. This shows that the commercial banks face competition from the insurance sector because the companies involve in socialized activities that are not allowed for banking sector.

The development of financial institution is a major improvement under the present regime and the first microfinance in Ethiopia was introduced as experiment in 1994. Currently there are 35 microfinance institutions and accounts for 12% of the financial sector capital respectively in June 2017. since micro finance institutions target low income groups and solve the problem of the delivery of financial services to the poor, which couldn't have access to banking services, the banking industry doesn't face notable competition from the MIFs.

1.2.3 Financial innovation and technological Advances

The rapidly growing information and communication technology are knocking the front door of every organization in the world including Ethiopia. Currently, the banks in Ethiopia are involved in adapting a wide array of financial innovation and technological advances. All of commercial banks implemented the core banking system and they interconnect their branches and enable their customers to have account access from any of the branches. The development of ATM, VISA card payment system, mobile banking service and agent banking solution and they are online real-time.

Although, the adoption of financial innovation and usage of technological advances are narrower in scope compared to some neighboring countries such as Kenya. The degree that the information technology spreads into the market is very low, which imply the lesser contestability in the market. However, in the future, when the basic infrastructure for telecommunications are developed widely in maintainable way, the implementation of technologies such as internet banking. This all will reduce the barrier to entry significantly, which in turn indicates strong contestability.

1.3 Competition

Competition is desirable for maximization of social welfare and existence of Pareto efficiency Selvi ak Kocabay (2009). In other words, in a competitive market setting, there is productive efficiency as well as dynamic efficiency. Hence, the issue of bank competition is a vital importance and the study of market competition can help understand the social welfare implications of changes in the banking sector. As in other industries, the degree of competition in the financial sector can matter for the efficiency of production of financial services, the quality of financial products , and the degree of innovation in the quality of specifically to the financial sector is the link between competition and stability.

Sound competition in the banking market is of great economic importance because it Lowers prices and improves quality, thereby contributing to the prosperity of consumers and companies alike. Furthermore, competition fosters innovative behavior, forces banks to improve their efficiency, thus promoting the access of households and firms to financial services and external

finance, and thereby enhancing economic growth. Competition improves the monetary transmission of policy rates to bank market rates. Jacob A. Bikker et al. (2007).
Thus, Competition in the banking sector is essential to increase the efficiency and soundness of the banking system. A competitive banking system allocates resources more efficiently. Therefore, a higher level of competition in the banking sector decreases the monopoly power of the banks.

Without competition it is improbable to bring about efficiency and promote financial sector development. Lack of bank competition drives high spreads explained by high profit margin across countries (Demirguc-Kunt and Huizinga (1999)). Unless there is competition in the market, banks exercise monopoly power and set higher rates for loans and lower rates for deposits: this discourages customers and affects the intermediary role of banks and leads to banks failure. The view that competition is clearly good in banking is more native than in other industries, and vigorous rivalry may not be the first best for financial sector performance.

Some empirical results are diverse across different income groups of countries. The nature of ownership matters for competition the penetration of foreign banks seems to be beneficial to developing economies. Developing countries with less-state-owned bank assets have a more competitive banking sector; hence less intervention of government is contributory to the creation of a competitive banking industry for low income countries (A. Mirzaei, et.al, 2014).

The role of bank competition varies depending on how restrictive is the regulatory environment of the banking sector. The possibility for banks to be active in multiple markets and face competition from nonbank firms in such markets may have an impact on the role of bank competition in the economy (Cetorelli, 2001). Fewer entry and activity restriction in less developed country are related with competitive banking system, but there is no evidence that contestability theory holds in advanced economies. It is argued that banking sectors in emerging and developing markets are characterized by higher market-power, relatively weak legal systems, and high levels of networking and corruption in their respective financial systems, which might constrain the strength of competitive forces compared with those in developed banking systems.

A concentration of market power in banking lead banks to extend credit to few firms, which grow in size and make their sectors concentrated, or rather bank concentration promote the continuous entry of firms the market structure of the banking industry and the related conduct of banking firms have an important role in maintaining a well-functioning economy .

1.4 Statement of the Problem

The market conditions in the banking sector deserve particular attention for many reasons (Bikker & Haaf, 2001). The financial sector reliability and stability may be influenced by the degree of competition and concentration. Competition has been regarded as a positive phenomenon for banks; it is supposed that competition makes banks more efficient, stimulates financial innovation and open up new markets.

Competition among banks is a topic of interest for academicians as well as supervisors. Recently, studies assessing competition in the banking industry have interested many academics due to potential relationships between completion and stability. Whereas a substantial number of studies consider banks in advanced countries, current studies focus on developing countries banking sector. Banking competition helps to lower transaction costs and it makes the financial market more efficient: as less completion negatively affects the efficiency of banks, it is essential to test for the presence of market power.

Zerayehu et al. (2013) the financial system in Ethiopia, which is characterized as highly profitable, concentrated, and moderately competitive is dominated by banking Industry and it is also amongst the major under banked economy in the world. The banking sector in Ethiopia has, for the past decades, undergone many regulatory and financial reforms which have changed the structural landscape of banking sector. One of such outcomes has been the entry of private banks into the Ethiopian banking industry. Currently, there are 16 domestic private commercial banks operating in the country. The fact that there is now stiff competition in the sector and that there is technological evolution integrated with the sector. (See Fortune 2015, Vol 16, no.794). However, the banking sector in Ethiopia is highly concentrated and it is dominated by Commercial bank of Ethiopia which is the biggest government-owned bank; CBE holds the largest market share in the

sector in terms of deposits, assets and loan. Those major trends that have been observed in the banking industry, aggressive expansion of Commercial Bank of Ethiopia and a number of new banks joining the sector have made the competition concentrated among private banks.

The empirical studies on the area of banking competition in Ethiopia are few in number and rarely available. For instance Zerayehu et.al (2013) studied on 2000-2008, the study not include recent opened banks. Besides, Zemzem and Gashaw (2014) analyzed structural competition of banking industry in Ethiopia from 2001-2012. Therefore, There is research gap and need to analyze these macroeconomic variables affect of competition in Ethiopian banking industry and both studies have include CBE, which is the most dominant public bank in Ethiopia, that means the result may not be the true picture and the result may be biased. So, this paper will fill the gaps by providing information about degree of the Ethiopian banking competition recently during the last 5 years (2013-2017).

According to Amidu et.al (2014), bank competition improves in Malawi, Ghana, Ethiopia and Mali respectively, and the improvement of the competitive environment in is likely to be driven by the deregulation and liberalization of the entire financial sector. Based on preliminary assessment result on the research topic indicated Ethiopian banking system operated under monopolistic competition market structure, highly concentrated and incontestable as entry. Then, concluded that competition in the Ethiopian banking industry is labeled as incontestable and difficult to enter owing to legal, technological and economic policy factors.

Several studies argued that private banks are more efficient than government-owned banks. Hence, to improve the competition level and enhance the efficiency of banking sector it is preferable to reduce activity restriction on private banks and improve the contestability of the banking sector. In the background of the above discussion, this study focuses on private banks for evaluating the extent of competition and what determinants affect competition in the Ethiopian banking sector.

Therefore, this study will attempt to examine the competition among private banks. That will make a contribution to the existing literatures on this area, specially in Ethiopia banking that give

awareness to banks about variables that highly affect their revenue and for regulatory bodies give consideration during decision making in banking industry.

1.5 Research Questions

To achieve the main objective of the study, the researcher has developed the following research questions that this study attempts to answer:

- What is the degree of Competition in the banking industry of Ethiopia over the period of 2013-2017?
- What are the major variables that drive the level of banking competition in Ethiopia?
- How significant does the three factors input prices, bank specific variables and microeconomic variables affect the banks' competition?

1.6 Objective of the study

1.6.1 General Objectives

The general objective of this study is to investigate the trend, nature and determinant of competition in the banking industry of Ethiopia.

1.6.2 Specific objectives

The specific objectives are as follows:

- To assess the degree and the extent of competition in the banking industry of Ethiopia.
- To identify the key bank competition drivers (PF, PL & PK) and/or to measure the significance level of the competition drivers in Ethiopian banking sector.
- To determine the effect of bank specific variables on competition in Ethiopian banking industry.
- To determine the effect of macroeconomic variables on competition in Ethiopian banking industry.

1.7 Hypothesis of the study

Based on the theoretical and empirical literatures, a number of hypotheses had developed regarding the relation between the competition of Ethiopia bank industry and the proposed independent variables based on different empirical research and theoretical review made from banks. Four hypotheses will develop:

- → H1: there is competition in Ethiopian banking sector.
- → H2: the 3 factor input prices (price of fund, price of labor and price of capital) has a significant effect on bank revenue in Ethiopia.
- → H3: Size of the banks significantly affects bank revenue.
- → H4: microeconomic variables: GDP and Inflation have significant effect on bank revenue.
- → H5: number of bank branch has direct relation with bank revenue.
- → H6: risk has direct relation with bank revenue.
- → H7: the ratio of loan to total asset has direct relation with bank revenue.

1.8 Significance of the study

The study has the following significance for policy makers, companies and stakeholders:

- → It will enable regulatory bodies to take deep-considerations on the impact regulations have on competition among banks during policy formulation and implementation.
- → The study will contribute to filling the literature gap and
- → It may serve as stepping stone for those who have further intentions to research on the subject area.

1.9 Scope of the study

The study is going to use quarterly data of all private commercial banks those are 16, for the years 2013-2017 (5 years) depending on data available.

1.10 Organization of the paper

The study organizes into four chapters. Chapter one presents an introduction, where the background of study, overview of Ethiopian banking sector, a statement of the problem, and

objectives of the study, research question, and significance of the study will be presented. Chapter two discusses an empirical and theoretical review of related literature. Chapter Three also presents research Methodology and data. Chapter four presents data presentation and analysis results. Finally Chapter Five presents conclusion and recommendations based on the findings.

Chapter two: Literature Review

Introduction

This chapter deals with the literature regarding competition of banking industry, recognizing and understanding the underlying concepts and definitions of the industry. So this chapter serves as background for this study by describing concepts and issues concerning bank competition. The review covers assessment of the theoretical aspects empirical works related banking competition and its determinants and followed by the review of the previous studies conducted in relation to banking competition is discussed.

2.1 Theoretical Literature Review

2.1.1 Competition in banking

As a first-order effect, expect increased competition in the financial sector to lead to lower costs and enhanced efficiency, even allowing for the fact that financial products are heterogeneous. In a theoretical model, Besanko and Thakor (1992), analyze the allocation consequences of a relaxing of entry barriers and find that equilibrium loan rates decline and on deposit interest rates increase, even when allowing for differentiated competition. As several recent research has highlighted, the relationships between competition and banking system performance, access to financing, stability and growth are, however, more complex (for a recent review of the theoretical literature on competition and banking, see Vives 2001). Market power in banking, for may up to a degree be beneficial for access to financing. The view that competition policy is unambiguously good in banking is more naive than in other industries and vigorous rivalry may not be the first best for financial sector performance. Neither does necessarily technological progress lowering production or distribution costs for financial services providers lead to more or better access to external financing. A few specific examples of theoretical papers will show these specific findings.

In a dynamic world, a bank and borrower establish relationships to overcome information problems. The higher its market power, the more likely the bank invests in information gathering about firms, especially to informationally opaque firms, and the more likely it provides credit

(Rajan, 1992). More competition can then undermine the incentives of banks to invest in a relationship. But the relationship involves sunk costs and leads to a hold-up problem: the incumbent bank has more information about the borrower than its competitors. This increases the switching costs for the borrower, especially for better quality borrowers since they will face adverse conditions when trying to look for financing from another bank, as they will be perceived as a poor credit. Borrowers will be less willing to enter a relationship with a bank if they are less likely subject to a hold-up problem, for example, when the market for external financing is more competitive. The net effect of these problems can vary with the overall competitive environment. Boot and Thakor (2000), for example, show that increased interbank competition may induce banks to make not less, but more relationship loans. There can also be effects from the type of information problem on the scope for potential competition. Dell'Ariccia, Friedman and Marquez (1999), show that the presence of information asymmetries in lending relationships can become a barrier to entry in the banking system.

The degree of competition in and stability of banking system will in turn depend on entry barriers, including on foreign ownership, and severity of activity restrictions, but also on the importance of other type financial institutions.

While some of these of relationships between competition and banking system performance and stability have been analyzed in the theoretical literature, empirical literature research, particularly cross-country research, on the issue of competition is still in an early stage. A hindrance for the cross- country research used to be data problems, as little bank-level data were available outside the main developed countries, but recently established databases are allowing for better empirical work.

Research indeed has shown that what matters in the end for financial sector efficiency, access, growth and financial stability are the functions that the financial sector provides which may or may not vary by financial structure (Demirguc and Levine, 2001). This importance of functions rather than institutions or structures may also apply to the issue of competition, suggesting that tests focusing on how the structure of institutions may affect competition are not complete.

Finally, financial services industries have been undergoing rapid changes, in part triggered by deregulation and technological advances. These changes have led to many changes, including

disintermediation, removal of barriers between financial products consolidation, increased cross-border capital flows, greater commercial presence, and more financial integration, as well as some risks and short-run costs. They have made the definition of a financial market and particular financial service more complex. They also have increased the network properties of financial services, making competition more complex, even when a pro-competitive entry or exist regime in terms of institutions or markets for varies types of financial services is in place. And it is making empirical analyses of the competitive nature of financial systems more complicated.

2.1.2 Measuring Competition

The fact that competition is a complex concept, and therefore not directly observable, has resulted in the development of many methods for its assessment. The assessment of competition in the banking industry has a long tradition. The literature on the measurement of competition is generally categorized into two major categories: structural and non-structural approaches. The structural approach has its roots in the theory of industrial organization that measures competitiveness following the structure-conduct-performance (SCP) and the alternative efficiency hypothesis (ESH).

The Structure-Conduct-Performance model (SCP) defined as the relationship between market structure, firm conduct and firm performance postulates that the existence of entry barriers is the major determinant of firm profits, thus the greater cost of entry makes it easier for existing firms to maintain monopoly profits. Considered differently, new entrants will diminish thelevel of those profits. Therefore, market concentration decreases the cost of collusion between firms and results in abnormal profits for existing firms in the market. The SCP has been one of the most tested hypotheses in the industrial organizations (Sinkey, 1986). According to Sinkey (1986) the microeconomic theory, the structure of the market influences the conduct and behavior of individual firms. The term structure, in the framework of SCP model, refers to the number of banks serving in the entire industry. Market structure responds to the internal variables, such as competition and regulation, as well as to external variables, such as technological changes, economic and population situations. The term conduct refers to the behavior of the banks in the market. This includes pricing, marketing and innovative behaviors of the business of banking.

The term performance refers to the quantity and quality of products and services provided by the banks in the industry.

The Structure-Conduct-Performance (SCP) paradigm, initially developed by Mason (1939) and Bain (1956), this approach evaluates banking competition by applying concentration ratios and indexes. They are three widely-used measures of concentration namely the number of firms, the concentration ratios and the Herfindahl-Hirschman index (HHI). Concentration Measures differ according to their weighting schemes and structure. The number of firms is the simplest index to compute insofar as the data requirement is very limited. However, this index does not take into account the distribution of firms. The K-bank concentration ratio sums only market share of leading banks in the industry. Simplicity and limited data requirements make the concentration ratio one of the most frequently used measures of concentration in the empirical literature. The HHI is more data intensive than the number of banks, insofar as it requires information on the market share of all banks to compute the level of concentration.

The major advantage of concentration measures is less requiring data. Even for developing countries, concentration measures can be computed at least at the national level. Concentration measures are the major indicators that used by many academics still present time. However, several studies have started to explore different components of the market structure. Mainly entry and exist situation. The theory of contestability contends that firms act intensely without entry and exist hindrances. Claessens (2009) suggested including regulatory issues to gauge the level of contestability. Contestability method considers regulatory issues such as entry barriers, openness to foreign bank entry, activity restrictions and capital requirements.

The theory contestability in contrary to the SCP paradigm; suggests that market structure and actual degree of entry or exit are not necessarily the most important factors in determining competition. Because, if firms in a market with no entry or exit barriers raise their price above marginal cost and begins to earn abnormal profits, potential rivals will enter the market to take advantage of these profits. When the existing firms responds by returning prices to levels consistent with normal profits, the new firms will exit. In this manner, even a single-firm market can show highly competitive behavior.

In spite of the fact that the SCP paradigms continue to be widely used in many empirical studies, some authors, however, raised doubt about the reliability of the SCP paradigms and associated structural measures of competition. In response to deficiencies found in the structural methods the non-structural measures of competition have been developed. The purpose of the New Empirical Industrial Organization (NEIO) methods is to directly assess the competitive conduct of firms without explicitly using information on the structure market. The non-structural approach is based on oligopoly theory and a static model of competition, The Lerner index and the Panzar-Rosse model are attached to this conception of competition.

Panzar - Rosse (Rosse and Panzar, 1977; Panzar and Rosse, 1982, 1987) is one of the non-structural methods to measuring competition based on a reduced form revenue equation. This approach emphasized on the degree of competition requires specific measures and techniques has become more used. The PR model provides a measure H-statistics of the degree of competitiveness of the industry. The H-statistics analyses the degree to which changes in input price are reflected in changes in banking revenues. If the input prices highly reflected the changes in the revenue the market is more competitive. The H-statistics is computed as the sum of the ratios of the percentage change in interest revenue or total revenue to the percentage change in the input prices. The value of H-statistics lies between negative infinity to positive one ($-\infty$ to $+1$). The magnitude of the computed results of the H-statistics shows the market structure of the industry. If the computed H-statics lies between zero and one, indicates monopolistic competition market structure. Whereas if H-statistics is equal to one ($H=1$) the market structure is perfect competitive and prices and total revenue increase by the same percentage. The H-statistic is zero or negative ($H<0$) for a monopoly. The major advantage of the PR model is it can be applied for the less matured banking industries as it doesn't require data and it can be obtained from a relatively small number of observations.

2.2 Empirical Literature Review

2.2.1 Previous studies (International level)

The literature on measuring bank competition has evolved mainly in two directions: the structural and non-structural approaches. Several empirical studies have used panzar and rosse model which is one of non-structural model. Those include Claesssens and leaven (2004), Al-mouharrami et al (2006), Aktan and Massood(2010), Hamza(2010) and Abel and Le Roux(2016).

Sanya and Gaertner (2012) investigated competitive condition of East Africa community countries using bank level data the result indicate monopolistic competition. Additionally they argued that those countries are less competitive than others that financially and economically advanced and also conclude that high concentration reduces competition.

Similarly, Gremi (2015) assessed the competition and efficiency in Albania banking sector and found high concentration, low competition and an increase in cost efficiency of the Albanian's banking sector. Podpiera et.al (2007) studied the market power and efficiency in Czech banking sector using Lerner index for period 1994-2005, the result indicated negative relationship between competition and efficiency. In contrast Repkove and stavarek (2013) assessed the relationship between competition and efficiency in Czech banking sector. Their result observed that there is positive relationship and the causality run from both sides. Korsah. et al. (2001) analyzed the competition and efficiency of Ghanaian banking system after implementing financial sector liberalization. The result indicates that following the liberalization competition has increased and the efficiency of the banks has also improved. Also Owusu-Antwi and Antwi (2013) evaluated the degree of competition in Ghana banking system after the financial restructuring. Their study result confirmed that Ghanaian banks had a perfect competitive market structure.

Casu and Giradone (2004) investigated the factors that influence the competitiveness of European banking during 1997-2003 by using concentration ratio and H-statics and the result seems to indicate concentration is not significantly related to degree of competition. Additionally

more efficient banking system is also more competitive, however the relation between efficiency and competition are not straightforward.

Doll (2010) tested competition and financial stability in Turkish banking system and found competition has negative effect on financial stability, concentrated banking sector less probable to face systematic banking crises and perfectly competitive banks are liable to financial crises. Beck(2008) argued that competition by itself is not a cause for the banking stability developed financial system with higher institutional quality, while fewer activity restriction, less entry barrier, and openness to foreign bank entry have likewise been observed to be connected with higher banking stability. In other hand Ak Kocabay, Selvi (2009) investigate impact of competition on stability of Turkish banking system for years between 1990 and 2008 based on individual bank stability measures and both structural and non structural measures of competition are used. The result indicate competition level in the banking system, macroeconomic stance of the country is an important determinant of banking system stability and found competition has a positive impact on stability. But he argued that relation between competition and stability of banking sector is complex and not straightforward and the sign of the relation changes with different model specifications. Similarly Allen et.al (2014) conclude that the relation between competition and financial stability is complicated issue.

Aljoša Babić et.al (2015), have tested the level of competitiveness in Serbian banking industry using Panzar-Ross model on bank level data in period of 2004-2012. These results suggest that the level of competition differs depending on the number and size of the observed banks. For the entire market, which is characterized by large number of banks, the estimated relationship between revenues and costs is in line with monopolistic competition among banks. The empirical findings indicate that competitive behavior of banks may be explained by factors other than the number of banks and levels of concentration in the banking sector. However, in interpreting results one has to be aware of certain limitations of Panzar and Rosse model. Firstly, the P-R model considers banks as financial intermediaries which produce single product, generating interest income using inputs such as deposits, capital and labor. Differentiation of products could be accepted if model results in a monopolistic competition for banking market. Secondly, the model assumes the same cost function for all banks, where higher input prices do not result in a higher-quality service or higher revenues. This may lead to a bias in estimated H-statistics,

although that bias is lower if null hypothesis of competitive market is rejected (Molynuex et al. 1996). Thirdly, P-R model has a static nature. This problem is partially overcome by using panel data, but examination of competition in the long-run would require a dynamic approach of observing changes in H-statistic over time.

Farhad et.al (2013) tried to investigate the competitive condition of the Iranian banking industry applying structural model and the H-statistic proposed by Panzar and Rosse. The results of estimation CR and HHI imply that the concentration indicators were reduced after structural changes in Iranian banking (for example; privatization, establishment of private banks and expansion new technologies). H-statistic based on a sample of 19 over the period 2005-2010 has confirmed total bank revenues appear to be earned in conditions of monopolistic competition during the sample periods.

Michiel van Leuvensteijn et.al (2008) analyzed the impact of loan market competition on the interest rates applied by euro area banks to loans and deposits during the 1994-2004 periods, using a Boone indicator. They found evidence that stronger competition implies significantly lower spreads between bank and market interest rates for most loan market products. This result implies that bank interest rates are lower and that the pass-through of market rates is stronger, the heavier competition is. Furthermore, in more competitive markets, bank interest rates appear to respond stronger and sometime faster to changes in market interest rates.

Kamau and Maureen (2013) analyzed the driving factors of banking performance in Kenya for the period 1997-2011 using SCP and recommend that decrease in concentration market power makes more competitive. Contrary, Hakam, Fatine and Zakaria(2013) investigated the determinants of banking competition in Morocco by using more than 20 years and the result shown that degree of competition is determined by several micro economic elements, the economic growth is negatively correlated with competition, that states unfortunately that when there is a constant economic growth the banks do not behave competing manner and try to preserve only their market share stimulated by a strong concentration of the sector. Then disputed there is positive relation between competition and concentration.

Several studies provide indirect evidence for the impact of contestability on banking competition. Claessens and Laeven (2004) using bank level data and applying Panzar-Rosse (1987), have tried to investigate the degree of competition in 50 countries' banking system and relate competitiveness measure to indicators of countries' structural and regulation regimes. Then they have found that, banking system with greater foreign bank entry and with less entry and activity restrictions is more competitive and they didn't found evidence that confirms the negative relationship between competition and concentration. The result highly supports the contestability hypothesis as contestability was found to influence competition.

Similarly the finding of Bikker A.et.al (2007) based on the Panzar–Rosse model to explain bank competition across 76 countries on the basis of various determinants. The result found that market structure indicators such as number of banks and banking concentration have no significant impact on market power. Instead, a country's institutional framework is a key factor in explaining banking competition. Extensive regulation, particularly antitrust policies, improves the competitive environment. The foreign investment climate, a proxy of contestability, also plays an important role. The fewer restrictions on foreign investments exist, the more competitive the banking sector becomes. In addition, activity restrictions make large banks less competitive and collusion markups are procyclical. Finally, competition is substantially weaker in countries with a socialist past, such as Central- and Eastern Europe. While, Turk-Ariss(2009) argued that contestability determines effective competition by allowing foreign-bank entry and reducing activity restrictions on banks in the Middle Eastern and North African banking sectors.

A number of studies suggest that industry structure and regulatory environment are important determinants of bank competition. Barth et al. (2004) draws new database on bank regulation and supervision in 107 countries to assess different governmental approaches to bank regulation and supervision and to evaluate the efficacy of specific regulatory and supervisory policies and find that tightening entry requirements reduces bank efficiency, which leads to higher net interest margin and overhead costs Restrictions on foreign bank participation tend to an increase in financial instability

Bikker and Haaf(2002) assessed the competition and concentration of 23 industrialized countries banking system by using Panzar- Rosses and bresnahan , found monopolistic competition in all countries. Furthermore their finding shows that the level of competition varies depending on the

size of the bank. Abel and Roux (2016) used Panzar and Rosse H-statistic and examined the degree of competition in Zimbabwe banking sector. The results indicated monopolistic competition in market and the level of competition has increased during the study period and evolved to perfect competition. Simpasa (2013) examine the competitive condition of Zambia banking sector using H-statistics of Panzar-Rosse and time varying Lerner index and found monopolistic competition. He further found that the regulatory barriers, allowing more foreign bank and privatizing of government owned the competitive condition of Zambian banking industry. Al-Mouharrami et al. (2006) studied the market structure of Arab Gulf Cooperation Council's banks during the period 1993-2002 using Panzar-Rosse model and the result confirmed that in total banks in Arab Gulf cooperation Councils are operating under monopolistic competition. However there is considerable variation between each Arab GCC country. Kuwait, UAE and Saudi Arabia are less concentrated and they are operating under perfectly competitive market structure. On other hand, banks in Qatar, Bahrain and Oman are highly concentrated and monopolistic competition.

A.Mirzaei, T.Moore (2014) have aimed to investigate the determinants of bank competition for 146 countries over the sample period 1999–2011. The results employing both the Lerner index and the Boone indicator reveal the distinctive characteristics of the competition drivers across different income groups of countries. They considered the banking market structure, contestability, inter-industry, institutional and macroeconomic environment for the determinant of competition. Argue a concentrated banking system jeopardizes the competitiveness in developing economies, however, such a causal nexus is absent for advanced and emerging economies. Contestability and institutional development seem to be the key driving forces of competition in less-developed banking systems; hence, less intervention of government is contributory to the creation of competitive banking industry for low income countries. Whereas, inter-industry competition and financial freedom are beneficial to advanced banking systems. The ownership structure seems to matter for bank competition in emerging and developing countries. But they didn't found evidence that contestability theory holds in advanced economies.

Delis (2012) has examined the degree of market-power as measured by the Boone indicator for 84 banking systems worldwide ,and finds that competition improves in developed countries with advanced institutions, however, it is unlikely to improve at the same rate in countries with weaker institutions.

Mohammed A. et.al, (2014), investigates the importance of globalization and institutional quality for African bank competition, using a sample of 330 banks in 29 African countries including Ethiopia during 2002-2009. They have employed the Boone indicator which measures the impact of efficiency on performance (Boone, 2008). The results suggest that bank competition in Africa increases progressively in the period 2002 through 2005, before declining somewhat between 2006 and 2007, and increasing again thereafter. The results of the multiple regression analysis suggest that globalization and institutional quality play a significant role in bank competition. Specifically, globalization enhances competition in countries with stronger governance structures and institutional quality.

2.2.2 Previous Studies (In Ethiopia)

In the Ethiopian case, there are only two of researches conducted to scrutinize the competition of banking in Ethiopian.

Zerayehu, et.al (2013), have assessed the trend, nature and extent of Ethiopian banking industry competition by employed qualitative, descriptive and quantitative econometric model. That applied both structural (HHI and CR) and non-structural (Panzar-Rosse) approaches, used bank level data for the period 2000-2007. Using interest revenue as dependant variable and explanatory variables; 3 factor input prices and 2 bank specific control variables without using macroeconomic control variables. The estimation technique is based on pooled cross section estimation with fixed effects and with cross section weighting. They indicated in Ethiopia, banks are competing in terms of service quality and efficiency, branch network expansions and advertising but competition in terms of price is relatively week. As per PR result interest revenue which is dependant variable, more substantially explained by Price of fund (interest expense). The econometrics result also confirm, bank with larger equity capital have proportionally higher gross revenue. They showed the Ethiopian can be characterized as highly

profitable, concentrated and uncontestable. However, there is monopolistic competition among banks in terms of prices.

Zemzem and Gashaw (2014) also tried to investigate the nature of the Ethiopian banking structure and competition from 2001-2012 by applied both structural and non-structural methods. Those are Concentration ratio, HHI index and Panzar and Rosse model. In PR, modeled both total revenue and interest revenue as dependent variables. The model includes explanatory variables that reflect the bank's behavior and risk profile very well that may affect revenues. The result confirms that price of fund is providing highest contribution to explained interest revenue and the bank size have positive relationship with bank revenue that implying larger bank generate higher revenue. Concentration ratios, including HHI index, show that the banking industry is highly concentrated but it is decreasing though slightly. In addition, the results from PR model estimate indicate monopolistic competition in Ethiopian banking industry. The value of H-statistic in total revenue based market is lower than that for interest income based market telling that there is lower competition among banks in non-interest based or fee based market.

2.2.3 Conclusion and Knowledge Gap

According to above discussion some of empirical work that has been done regarding banking industry competition. Different scholars using empirical investigation on banking competition are arriving at dissimilar conclusions.

For instance, Gremi (2015), Sanya and Gaertner (2012), and Al-Mouharrami et al. (2006) argued on concentration and competition has negative relationship. In contrast Hakam, Fatine and Zakaria(2013) indicated the positive relationship between concentration and competition. But classence and leaven (2004), Casu and Giradone (2004) suggested that there is no significant relationship between competition and concentration. In addition, Podpiera et.al (2007) found a negative relationship between competition and efficiency. While Repkove and stavarek (2013), Korsah. Et al. (2001) argued that there is positive relationship between competition and efficiency. Moreover, Doll (2010) argued competition has negative impact on financial stability. On the contrary Ak Kocabay, Selvi (2009) has found competition has a positive impact on stability. But he concluded that relation between competition and stability of banking sector is complex and not straightforward and the sign of the relation changes with different model

specifications. Gale (2014) also confirmed that the relation between competition and financial stability is complicated issue. Therefore, the findings of studies may not be applicable in the less developed banking system like Ethiopia, so this study will analyze and tests whether the findings and theory of banking competition are related or contrasting with what the literature says.

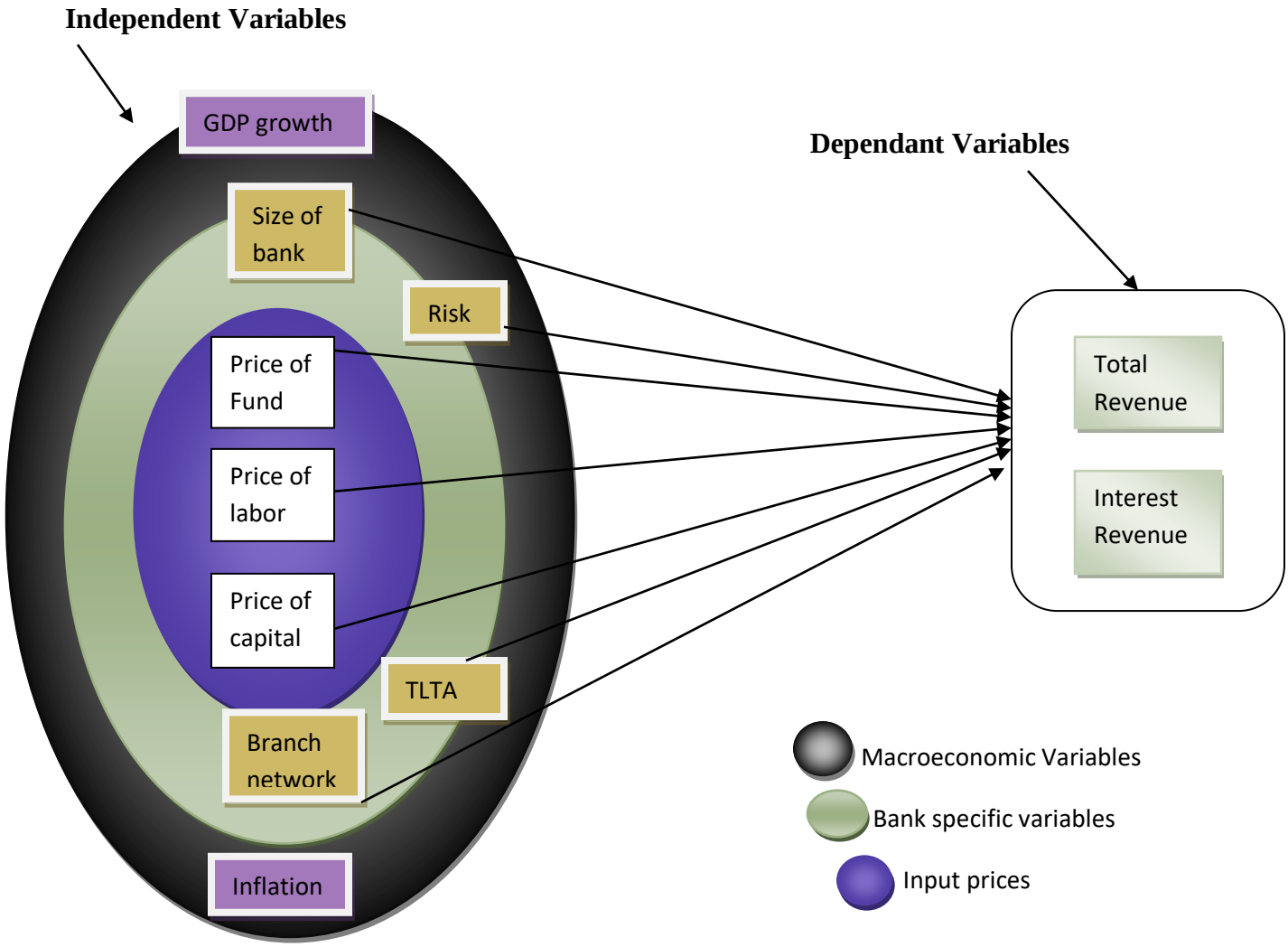
There are no several studies that are indicating the effect of macroeconomic variables on banking competition. Surprisingly, Hakam et.al (2013), found economic growth; GDP is negatively correlated with competition.

The finding of studies in Ethiopia may not give the true picture about Ethiopian banking competition due to some gaps; the researches have not showed the impact of macroeconomic variables in Ethiopian banking competition, and the data include CBE that is the most dominant bank in Ethiopian banking industry.

2.3.4 Conceptual framework

Empirical evidences apply Panzar-Rosse suggested that Revenue of banking industry affected by factor input prices, bank specific control variables and macroeconomic variables. This study used both Interest revenue and total revenue as dependant variables regarding the factor input prices, PF stands for cost of fund, PL denotes price of personnel expenses and PK is the price of physical capital expenditure.

Figure 1: Conceptual frame work



Source: self extracted

Bank's production function uses labor, fund and physical capital to attract deposits. The deposits are then used to fund loans and other earning assets. The dependant variables are the ratio of total revenue to total asset (TR) and interest revenue to total asset (IR). The set of explanatory variables embraces three factor input prices; price of fund (PF), price of labor (PL) and price of capital (PK). Input prices are commonly proxied by ratios of expenses to respective volumes, price of fund (PF): the ratio of interest expense to total fund, price of labor (PL): the ratio of

personnel expense to asset and price of capita (PK): the ratio of general operating expense to total asset.

The ratio of annual personnel expenses to the number of fulltime employees may be a better measure of the unit price of labor (PL), but reliable employee figures are only available for a limited number of banks. Therefore, in this study used total asset in the denominator instead, following other studies that use Bank Scope data; see e.g. Bikker and Haaf (2002) and Goddard, Wilson (2009) and Zemzem and Gashaw (2014).

This paper include four bank specific control variables which are, total asset (TA) used as size indicator, the proxy of nonperforming loans (risk) that is the ratio of provision to total asset, TLTA is the ratio of total loan to total asset, and BR (branch network) is the ratio of the number of the bank branch to the total number of branches of all banks. To determine the relationship between bank revenue and macroeconomic factor inflation rate and GDP growth used as control variables.

The sign of the input prices in the revenue equation will depend on the competitive environment. Under perfect competition an increase input price will increase marginal cost and marginal return by the same amount. All bank specific variables and GDP expect direct relation on bank revenue. But inflation rate has negative effect on bank revenue.

Chapter Three: Research Methodology and data

Introduction

This section presents the methodologies that will be employed to achieve the study's objectives. Research methods are specific technique or methods of data collection and analysis used to achieve the broad objective through addressing a research questions and specific objectives.

3.1 Research Design

The main objective of the study was to investigate the trend, nature and determinant of competition in Ethiopia banking sector by using Panzer-Rosse model. In doing so, the study adopted explanatory approach by using balanced panel data research to realize the stated objective.

3.2 Sample Size

Out of the total seventeen (17) commercial banks, all private commercial banks that those are sixteen (16) were selected for the purpose of the study (purposive sampling).

3.3 Data Source

To achieve study objectives, the study utilized comprehensive quarterly panel dataset of Ethiopian banks ranging from 2013 to 2017. The data collected from the balance sheet & income statement of banks. It incorporates all banks in the financial sector according to the fitness of the available data to the different model analysis. Bank –level data collected from National Bank of Ethiopia (NBE).

Proclamations and regulations related to banking and finance, Directives issued by the monetary authority (NBE), and other relevant articles and books were reviewed.

3.4 Methodology

The purpose of this study is to analyze the competitive condition and major determinants in Ethiopian banking industry. Therefore, in order to address the research questions of the study and

to achieve its specific objective the researcher apply mixed research approach. To assess the degree of competition, the researcher estimates the structural measures (CR and HHI index) and compared to non-structural indicator. This paper focuses on the non-structural methods of Panzer and Rosse model (PR) revenue test, which has been much more widely used in empirical banking studies, as well as in non-banking studies. This indicator has sound theoretical foundations and empirical appeals and had been applied to banking data from other African countries such as Ghana, Morocco, Nigeria, Tunisia, Zimbabwe and Zambia.

3.4.1 Bank Concentration Ratio

The k-bank concentration ratio is one of the most frequently used measures of concentration in the empirical literature. It measures the extent of concentration in the banking industry by computing the market share of the top k largest banks (usually three or five) in the market:

$$CR_k = \sum_{i=1}^{N} s_i$$

3.4.2 Herfindahl-Hischman index (HHI)

The Herfindahl-Hischman index (HHI) is commonly used measure of market concentration that measures the size of bank in relation to the industry and serves as an indicator of the degree of competition among banks. It is simply the sum of the squares of the market shares for each firm within the industry and is always less than one. The major advantage of the HHI over the concentration ratio is: it comprises the number of firms in the industry which is not included in the k-bank concentration ratio. The HHI increases both as the number of firms in the market increases and as the disparity in size between those firms' increases.

The HHI is computed as,

$$HHI = \sum_{i=1}^{N} s_i^2$$

Where MS is the market share of firm ith in the market and N is total number of firms in the market. The result of HHI is interpreted as follows: if the value of HHI is more than 0.18

indicates highly concentrated market, if the HHI lies between 0.10 and 0.18 moderate concentration, if HHI is below 0.1 it indicate that the market is unconcentrated, finally the HHI index less than 0.01 the banking industry is considered as a highly competitive market.

3.4.3 Panzar-Rosse Model

Panzar and Rosse model present a reduced form approach using industry or bank-level data and provides a measure H-statistics of the degree of competitiveness of the industry, which is calculated from reduced form bank revenue equations as the sum of the elasticity of the total revenue of the banks with respect to the bank's input prices (price of labor, price of fund and price of capital) are reflected in bank-specific revenues.

Several specifications of the Panzar and Rosse model have been used in the empirical literature; the choice of firm dependant and the firm-specification control variables varies. However, the major differences have noticed in the choice of the dependent variable that applied in the estimation of H-stastics. Casu and Girardone (2004), Al-Mouharrami et at.(2006), Simpasa(2013), Abel and Le Roux (2016) used total revenue while, Bikker and Haaf(2002), Maudos and Solis (2011)etc used interest revenue as dependent variable by considering that financing intermediation is the business of most banks. The others used both interest revenue and total revenue.

For the robustness of the result, this study employ Panzar-Rosse model will applied by using both total revenue and interest revenue as dependant variable including explanatory and other bank specific & macroeconomic control variables.

To investigate the effect of bank-specific input prices in bank-specific revenue, the following general multiple regression models is adopted from different studies conducted in the same area.

$$\mathbf{R_{it} = \alpha + \beta_1(BANK)_{xt} + \beta_2(MAC)_{yt} + \varepsilon_{it}}$$

Where,

i: refers to an institution;
t: refers to year;
R_{it} : represent is a dependant variable for the bank i at time t;

α, β1, β2and β3: represent estimated coefficients of independent and control variables including the intercept;

(BANK)xt : represent the x-th bank-specific determinants at time t;

(MAC)yt : represent the y-th macroeconomic determinant at time t and

εit: is error term.

In this particular study Panzer-Rosse H-statistic will calculated by estimating the reduce form of revenue equation as follows.

$$\ln TR = \beta + \beta_1 \ln(PF) + \beta_2 \ln(PL) + \beta_3 \ln(PK) + \beta_4 \ln(TA) + \beta_5 \ln(RISK) + \beta_6 \ln(TLTA) + \beta_7 \ln(BR) + B_9 \ln(GROWTH) + \beta_{10} \ln(INFL) + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The H-statistic is then obtained as the sum of the coefficients of factor prices as follow;

$H1=\beta_{1+}\beta_{2+}\beta_{3.}$ H1 refer as the H-statistic based on equation 12).

$$\ln IR = \beta + \beta_1 \ln(PF) + \beta_2 \ln(PL) + \beta_3 \ln(PK) + \beta_4 \ln(TA) + \beta_5 \ln(RISK) + \beta_6 \ln(TLTA) + \beta_7 \ln(BR) + B_9 \ln(GROWTH) + \beta_{10} \ln(INFL) + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$H2=\beta_{1+}\beta_{2+}\beta_{3.}$ H2 refer as H-statistic based on equation (2)

Table 1: Interpretation of H-statistic and E-statistic

Equilibrium Analysis	
E = 0	Equilibrium
E < 0	Disequilibrium
Competitive Conditions	
H <= 0	Monopoly or conjectural variations short-run oligopoly
0 < H < 1	Monopolistic Competition
H=1	Perfect competition or natural monopoly in a perfectly contestable Market or sales maximizing firm subject to a break-even constraint

Source Panzar-Rosse (1987)

Table 2: Variables Description (for the variables will used in Panzar-Rosse Model)

VARIABLES	DESCRIPTION
Dependent Variables	
TR	The ratio of total revenue to total asset. Total revenue includes both interest and non-interest revenue of banks. It captures overall activates of the banks.
IR	The ratio of interest revenue to total asset. It is used as a dependent variable to capture only the intermediation activates of banks.
Independent Variables	
PF	Price of fund, the ratio of interest expense to total funds (deposit). This reflects the unit price of attracted funds.
PL	Price of labor, the ratio of personnel expenses to total asset. It is a proxy for the price of labor.
PK	Price of capital, the ratio of general operating expenses to total assets. This is the proxy for average price of capital.
Bank specific control variables	
TA	Individual bank total assets: to control for the potential size effects.
RISK	Loan loss provision: the ratio of provision to total loans, for loan the proxy of the non-performing loan, variable characterizing risk.
TLTA	The ratio of customer loans to total asset. Used to control the business mixture of the banks.
BR	Branch Network: The ratio of the bank's number of branches to the total number of branches for all banks
Macroeconomic control variables	
GROWTH	The rate of growth of GDP, Used to account macroeconomic effect on bank revenue.
INFL	Inflation rate. Used to account macroeconomic effect on bank revenue.

3.4.4 Panzar-Rosse Long-run Equilibrium

The validity of the Panzar-Rosse model is based on the assumption that market are in long-run equilibrium when the data are observed. particularly as stated by Casu and Giradone (2004): " the empirical test for equilibrium is suggested by the fact competitive capital markets will equalized risk-adjusted rates of return across banks such that, in equilibrium, rates of return should not be correlated statistically with input prices".

The equilibrium test is performed by replacing the dependant variables (TR and IR) in equation (2) or (3) with ROA and ROE as follows:

$$lnROA = \beta + \beta_1 ln(PF) + \beta_2 ln(PL) + \beta_3 ln(PK) + \beta_4 ln(TA) + \beta_5 ln(RISK) + \beta_6 ln(TLTA) + \beta_7 ln(BR) + B_9 ln(GROWTH)\ \beta_{10} ln(INFL) + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

$$lnROE = \beta + \beta_1 ln(PF) + \beta_2 ln(PL) + \beta_3 ln(PK) + \beta_4 ln(TA) + \beta_5 ln(RISK) + \beta_6 ln(TLTA) + \beta_7 ln(BR) + B_9 ln(GROWTH)\ \beta_{10} ln(INFL) + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Where:

ROA = return of asset ROE = return on equity

The equilibrium E-statistic defined as $E = \beta 1 + \beta 2 + \beta 3$, where E denotes the equilibrium. We test whether E=0, by using F-test. The equilibrium is argued to exist in the market, if $\beta 1 + \beta 2 + \beta 3 = 0$ if the null hypotheses of E= 0 rejected, it means the market is not in long-run equilibrium.

3.5 Estimation Technique

The multiple regression models was used, in order to achieve the objectives of this study and analyze the relationship between revenue (the dependant variable) of the banking sector and the independent variables, factor input prices and other control variables. EVIEWS 8 is used to analyze the collected panel data and the results were presented with tables and figures.

The panel or longitudinal data provide information on individual behavior, both across individual and over time they have both cross-sectional and time series dimensions. In this study the different banks included reflects cross-sectional component and the period of study (2013-2017) reflects the time series component.

3.5.1 Model Specification test (Fixed effect Versus Random effect)

In this study, balanced cross sectional panel regression was used to see whether there is a significant relation between dependant variables and independent variables. In order to ensure the appropriateness model whether random effect or fixed effect, Housman test is applied for the random effects estimation output. But the researcher found a statement it said like cross sectional test variance is invalid Housman test statistic set to zero. Therefore, fixed effects model is used for this study.

3.5.2 Model Assumptions

The diagnostic tests were carried in order to ensure the data is in consistency with the linear regression models based on the following assumptions:

1. $\mathbf{\varepsilon\ (ut) = 0,}$ *the errors have zero mean*

2. $\mathbf{Var.\ (ut) = \sigma 2 < \infty}$ *the variance of the errors is constant and finite of all over values of* X_t

3. Cov (ui, uj) = 0 for $\mathbf{i \neq j,}$ *the errors are spastically independent of one another*

4. ***The Xt are non-stochastic,*** *no relationship between the error and corresponding x variate*

5. **The disturbances are normally distributed**

Chapter Four: Data Presentation and Analysis of Results

Introduction

This chapter deals with the results of the study which include analysis of concentration ratio, diagnostic tests, descriptive statistics, and regression result of both equilibrium test and competitive environment test.

4.1 Bank Concentration Ratio result

The concentration ratios are based on the idea that the behavior of the market is dominated by a small number of large banks and are usually used to show the extent of market control of the largest firms in the industry.

Table 3: Privet Banks concentration Ratio (2013-2017)

Year	Asset		Loan		Deposit	
	CR3	CR5	CR3	CR5	CR3	CR5
2013	0.4908	0.6841	0.4737	0.6852	0.4812	0.6843
2014	0.4724	0.6539	0.4406	0.6233	0.4545	0.6441
2015	0.4220	0.5972	0.4033	0.5645	0.4224	0.6025
2016	0.4052	0.5807	0.3918	0.5601	0.4024	0.5757
2017	0.3967	0.5633	0.4037	0.5687	0.3921	0.5565
Average	0.4374	0.6158	0.4226	0.6003	0.4305	0.6126

Source: Author's computation

The study used three big banks (CR3) and five big banks (CR5) concentration ratio i.e. based on their total asset.

CR3= DB, AIB & BOA were the first, the second and the third largest banks respectively in 2013 & 2017, DB, AIB & UB from 2014 up to 2016 respectively.

CR5= DB, AIB, WB, BOA & UB were the first, the second, the third, the fourth and the fifth largest banks respectively

As per the above table, the share of three big banks in the total assets of banking industry was 49% in 2013 and declined significantly to 39% in 2017 ,also the share of loan also decline from 47% to 40% and deposit decrease from 48% to 39 . Similarly the share of five big banks in total asset, loan and deposit were 68.4%, 68.5% and 68.4% respectively but declined significantly to 56.3%, 56.9% and 55.6% from 2013 to 2017.

The average market concentration for asset is 43.7 percent for CR3 and 61.6 percent for CR5 in the sample period. The average share of loans is 42.3 percent and 60 percent for CR3 and CR5 respectively. While the average share of deposit is 43.1 and 61.3 percent.

In conclusion, those three and five big banks are slightly dominated the bank industry but their share is gradually declining with specific regards to Asset, loan and deposit. The trend of concentration ratio has been declining and can be attributed to the new entrants and improvement in the asset, loan, and deposit position of other private banks in the industry.

Table 4: HHI of the banking industry in Ethiopia for three indicators of market share (2013-2017)

Year	Herfindahl-Hirschman Index		
	Asset	Loan	Deposit
2013	0.1208	0.1182	0.1180
2014	0.1132	0.1070	0.1087
2015	0.0991	0.0966	0.0988
2016	0.0937	0.0912	0.0935
2017	0.0904	0.0927	0.0898
Average	0.1034	0.1011	0.1018

Source: Author's computation

Table 4, summarizes Herfindahl-Hirschman Index on total asset, loan and deposit of Ethiopian banks for the period of 2013-2017. The HHI summarize how Total asset, loan and deposit concentration vary over the sample period.

The market concentration ratio of total asset, loan and deposit were declined from 12%, 11% and 11% in 2013 to 9% 2017. That means 2013 was moderate concentrated market but from 2015-2017 the result indicate Ethiopian banking industry is unconcentrated market. This shows that the competition within Ethiopian banking industry is improving from time to time.

The average results of HHI on asset, loan and deposit are around 10%. This show that the banking sector in Ethiopia is moderate concentrated. The HHI was lies between 0.1 & 0.18 in all asset, loan and deposit basis. Even though since 2015 the result is decreasing and lies below 0.1.

Both structural measures (CR and HHI) show that the banking industry in Ethiopia is not highly concentrated; however, as emphasized by several empirical studies such as Classen and Leaven (2004), Casu and Girardone (2004), the concentration measures are not a holistic proxy for market structure. Therefore, the author applied PR-model to further investigate the level of competition.

4.2 Diagnostic test

In order to validate the model the following tests were conduct: Autocorrelation, normality test & multicolinearity.

4.2.1 Test for Autocorrelation:

In using OLS model the most important assumption is that errors term are uncorrelated with one another. This assumption basically lies on the notion that states covariance between the error terms over time is zero. Durbin-Watson from the regression results was used to check for autocorrelation.

- → Ho: The residuals are not serially correlated
- → H1: The residuals are serially correlated

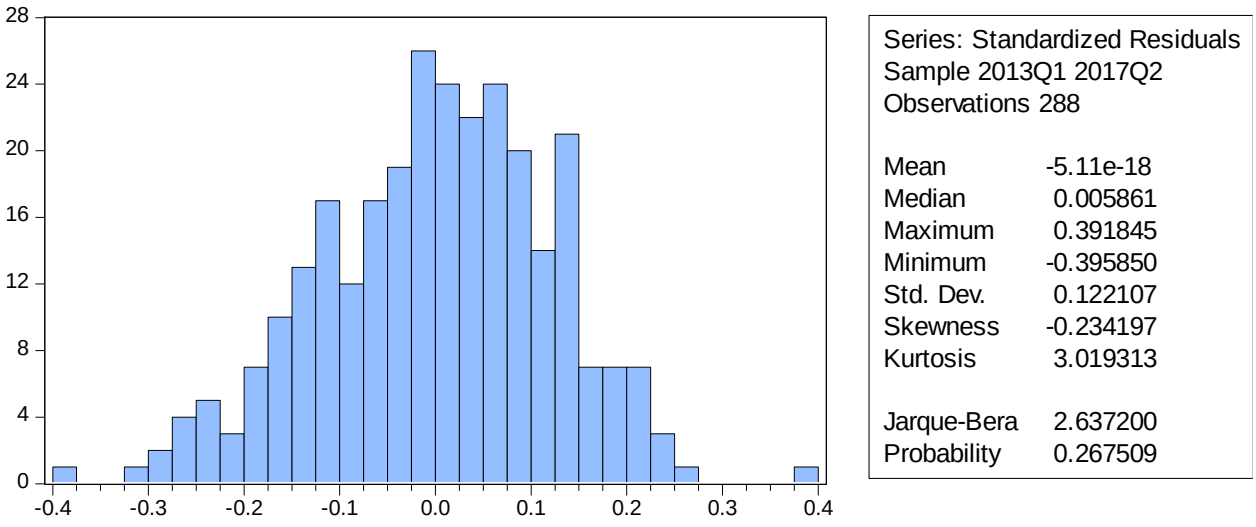
DW test statistic values in the regression result were 2.1644 & 1.8745 for both model 1 and 2 respectively with total number of observation as 288. The critical values were used to interpret the result of the autocorrelation test. The critical d_L is 1.75106 and d_U is 1.86434. The value of 4-d_L = (4-1.75106) = 2.24894 and the value of 4- d_U (4-1.86434) =2.13566. The DW value in regression 2.1644 and 1.8745 are between the upper (1.8643) and 4 minus the lower limit

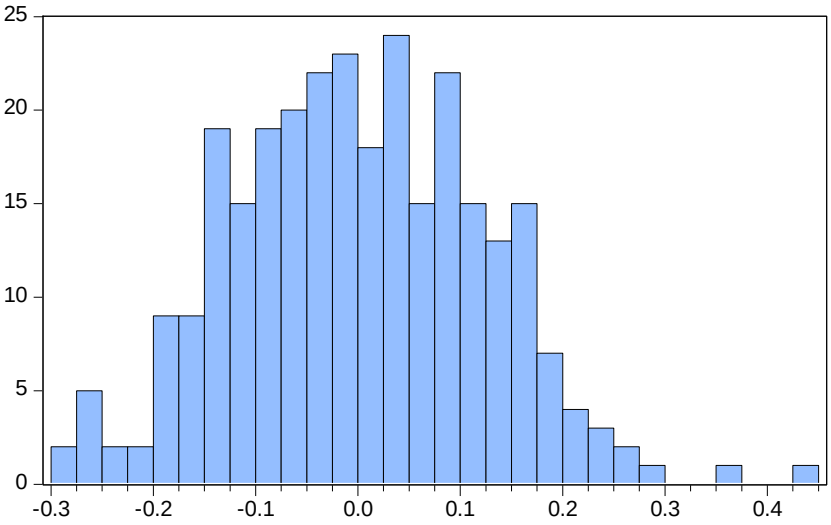
(2.2489) hence, the null hypothesis of no autocorrelation is not rejected concluding that there is no significant residual autocorrelation.

4.2.2 Test for Normality Test:

The residual normality distribution is tested using histogram, Bera-Jarque test. If the residuals are normally distributed, the histogram should be bell- shaped and the Jarque-Bera statistic would not be significant meaning disturbance to be normally distributed around the mean. The *p*-value should be significant to reject the null hypothesis that is the residuals are normally distributed.

Figure 2: Regression model normality test Total Revenue & Interest Revenue based regression respectively





Source: Author's computation from (Eviews 8)

The result in the above figure 2, confirms that the residuals are normally distributed as *p*-value of the Jarque-Bera is greater than 5% and kurtosis near to 3 in both models.

4.2.3 Test for Multicollinearity:

Multicollinearity in the regression model suggests substantial correlations among independent variables. If there is a high correlation between multiple independent variables it would compromise the result and bias regression estimate. Hair et.al. (2006) noted that if the coefficient of independent variables is below 0.9 there may not be a serious multicollinearity problem. Multicollinearity can be assessed by examining correlation matrix.

Table 5: Correlation matrix between Independent Variables (2013-2017)

Correlation	LNPF	LNPL	LNPK	LNTA	LNRISK	LNTLTA	LNBR	LNGDP	LNINF
LNPF	1.0000								
LNPL	0.5231	1.0000							
LNPK	0.6949	0.6758	1.0000						
LNTA	0.0374	0.0103	-0.3067	1.0000					
LNRISK	-0.0374	-0.0102	0.3069	-0.9998	1.0000				
LNTLTA	0.0450	0.1197	0.0071	0.3925	-0.3914	1.0000			
LNBR	-0.1736	0.0823	-0.3648	0.7421	-0.7420	0.3819	1.0000		
LNGDP	0.0803	0.3201	0.0576	0.3579	-0.3579	0.3726	0.0426	1.0000	
LNINF	-0.1209	0.0064	-0.0846	0.1530	-0.1527	0.2148	0.0341	0.3654	1.0000

Source: Author's computation from (Eviews 8)

The result in above table 5, show that the correlations between independent variables are below 0.75 indicating that there is no serious multicollinearity between variables. However, between total asset and risk there is highly negative correlation. That mean when size of the bank increase, the risk on the loan will be decrease. That implies the banks use strong loan appraisal & specialize their loan product to minimize defaulted loans.

4.3 Descriptive statistics:

The descriptive statistics of both dependent and independent variables are presented in table 6, below. For 16 private banks for period of 18 quarters from 2013 Q1 to 2017 Q2 with total 288 number of observation.

Table 6: Descriptive Statistics (2013-2017)

	Mean	Median	Maximum	Minimum	Std. Dev.	Obse.
PF	0.0229	0.0215	0.1757	0.0043	0.0154	288
PK	0.0157	0.0141	0.0681	0.0014	0.0099	288
PL	0.0117	0.0096	0.0860	0.0010	0.0106	288
TA	10,312.97	7,995.70	43,169.13	259.10	8,725.26	288
RISK	0.0445	0.0187	0.5747	0.0034	0.0770	288
TLTA	0.4553	0.4635	0.5819	0.0219	0.0718	288
BR	0.0625	0.0633	0.1365	0.0019	0.0367	288
GDP	180.31	179.60	218.60	143.75	22.54	288
INF	2.0194	2.0840	4.5178	-0.1416	1.5095	288
TR	0.0647	0.0659	0.1493	0.0139	0.0289	288
IR	0.0377	0.0376	0.0714	0.0060	0.0168	288
ROA	3.1039	2.9850	6.9500	0.0500	1.0267	288

ROE	24.34	22.08	81.39	0.40	10.59	288

Source: Author's computation from (Eviews 8)

As the result of the above table, the analysis of the descriptive statistics on all variables show there is no significant difference between mean and median. The value of the size measure variable (asset) shows a little difference between mean and median statistics, which indicate that the modest degree of domination of large bank over the sample period, the concentration ratio results also confirm this. Likewise, the maximum value is birr 43,169.1 million and minimum value is birr 259.1 million. This indicates that big disparity of size (total asset), due to there were a new entrant banks in Ethiopian banking industry. Both the profitability measures (ROA and ROE) show that Ethiopian banks have earned a positive profit for the last 5 years. On the other hand the lowest standard deviation for (0.009) show that all the data's are clustered around the mean and thus more reliable.

4.4 Regression result

4.4.1 Equilibrium test result

The adapted PR-model requires testing for long-run equilibrium and the model is only valid if the market is in equilibrium during the period of the test. The equilibrium test relies on the fact that in competitive markets the risk adjusted rates of return will be equalized across banks. In such a case, the input prices should not be correlated with bank's profitability. The equilibrium test is examined using ROA and ROE as dependent variables in model 3 and 4.

→ **Null Hypothesis , H0: E=0, E(1)+E(2)+E(3) = 0**

Table 7: Equilibrium test of banking market fixed effects panel model

	LNROA		LNROE	
Variables	**Coefficient**	**t-Statistic**	**Coefficient**	**t-Statistic**
C	-36.2554	-1.2823	-42.7011	-1.1518
LNPF	0.1525	1.3409	0.3918	2.2501
LNPL	0.0490	1.5789	0.0342	0.9800
LNPK	-0.1133	-1.2950	-0.3583	-2.4469
LNTA	8.1213	1.4698	9.9662	1.3851
LNRISK	8.0963	1.4539	9.7533	1.3385

LNTLTA	0.3001	3.8792	0.1534	1.3195
LNBR	-0.0983	-0.9161	-0.1413	-0.9695
LNGDP	-0.6099	-1.1324	-0.9840	-1.7116
LNINF	0.0173	0.4988	0.0143	0.4551

Equilibrium test : H0: E=0, E(1)+E(2)+E(3)=0		
E=Statistic	0.0883	0.0677
Probability	0.2631	0.5246

Source: Author's computation from Eviews 8

As per the result of the above table 7, the Wald test in all cases does not reject the null hypothesis; H0:E1+E2+E3=0, which lead us to conclude the banking sector in Ethiopia was in the long-run equilibrium under the sample period (2013-2017).

4.4.2 Competitive Environment Test Result

The long-Linear equation (1) and (2) on methodology section is estimated with Fixed effect model using balanced panel data to test for competitive condition of Ethiopian banking industry for the sample year 2013-2017, and the results are presented in table 8, the statistical tests confirm that the model fits the data very well. The Adj.R^2 show that the regression equation explain 90% and 89% of the variations in Interest revenue and Total revenue respectively, while the model test (F-statistics) show that the models fit the data.

The estimated H-statistics is positive and significant regardless of independent variables used total revenue & interest revenue proving the hypothesis of the study (H2: PF, PL & PK) have a significant effect on the bank revenue. For the sample period the estimates for coefficient parameters most are statistically significant. The estimated H-statistics are 0.93 & 1.0 in both revenue (TR & IR) regression, and slightly lower under IR estimation. The wald test is used to determine the statistical significance of the null hypotheses. The result of wald test confirms that we can decisively reject the null hypothesis monopoly (H=0) but we cannot reject the null hypothesis perfect competition (H=1); this allows us to conclude that the Ethiopian banking industry has been operating under perfect competition condition during the period 2013-2017. This also proves the first hypothesis: there is competition in Ethiopian banking industry.

All the three input prices have significant and positive effect on interest revenue, that is proving the second hypothesis (H2: PF, PL & PK) have a significant effect on the bank revenue. Price of fund (PF) and price of capital (PK) also significant and positive in total revenue based regression, but price of labor has insignificant effect on total revenue. The price of fund (PF) provides the highest contribution to explanation of both the Interest & Total revenues, since interest expense is the main element of variable cost among banks. This result is consistent with Zemzem and Gashaw (2014) and Zerayehu et.al (2013). The coefficient of price of labor is lower than other two prices, that reflecting personnel costs couldn't be an important driver of overhead costs.

From bank-specific control variables, the variable BR (branch number) has positive sign and significant effect at 1% significance level on interest revenue and total revenue. Hypothesis 5 (H5: the number of branch has direct relation with bank revenue) is proved. Implying that banks with many branches have a chance to generate higher revenue and compete, by locating branches close to clients, taking advantage of the fact that clients place value on being close to services.

The ratio of total liability to total asset, TLTA has a positive sign on both revenues that is proving the sixth hypothesis, but significant effect at 1% only on interest revenue in regressions, which is the ratio of loan to total asset is in line with expectation, as the banks accumulate more loans it means, they would generate more interest revenue the finding of this study is similar with Duncan et.al (2002) and Sekmen et.al (2015).

The size variable (total asset) has positive but insignificant effect in both revenue. That hinting at the positive effects of size, the large bank, the higher and the revenue it generates. Hypothesis 3 (H3: the size of bank has a significant effect on bank revenue) is disproved, statistically as variable asset is insignificant in all regressions that implying the size doesn't matter in generating revenue, the result contradicts to the finding of Hamza (2011), Owsu-antwi & antwi (2013), who both found a negative relationship between bank asset & revenue.

The loan provision (risk) as an indicator and the loan portfolio quality has positive coefficient) but statistically insignificant effect in both revenue, risk has not a big impact on the banks revenue. However, particularly loans are provisioned while granted and interest revenue is

accounted on accrual basis, the banks give a loan which is more risky with highest interest rate. Under this condition positive correlation is observed that is proving the hypothesis (H6: risk has direct relation with bank revenue). The result is consistent with the findings of Fosu (2013) and Zerayehu et.al (2013) but, disagree with the result of Simpasa (2013) in Zambia who found that negative and significant relationship between risk and bank revenue.

The macroeconomic variable, the GDP growth has positive and significant effect as expected, at 1% significance level on Interest revenue, that is proving the fourth hypothesis (H4: microeconomic variable ; GDP has significant effect on bank revenue). On other hand, it is found to be positive but insignificant on total revenue. The positive relationship between GDP and interest revenue indicates that when the economy is doing well banks make profit from interest income. The positive insignificant relationship between GDP and total revenue may be implying that it does not matter whether the economy is growing or not.

The other macroeconomic variable inflation rate used to indicate the macroeconomic stability has a significant effect at 1% level on both revenues. Hence, hypothesis H4: (microeconomic variable; inflation has significant effect on bank revenue) has been proved. Inflation has positive coefficient on interest revenue based regression, it shows the banks interest revenue increases when there is high inflation. This result confirms the finding of Simpasa (2013) who found the positive relationship between inflation and bank revenue. However, this result may due to banks tend to develop some measures to protect interest revenues from attrition under high inflationary conditions.

Over all the study concludes that the banking market in Ethiopia is operating under a perfect competitive condition. However; the results of this study are different from the study undertaken by Zerayehu et.al (2013), and Zemzem and Gashaw (2014). Who found Ethiopian banking markets to operate under monopolistic conditions.

Table 8: Test of Competition in banking sector fixed effect panel data

	LNTR		LNIR	
Variables	**Coefficient**	**t-Statistic**	**Coefficient**	**t-Statistic**
C	-38.4952	-0.6116	-25.83304	-0.44979
LNPF	0.5884***	5.9825	0.4671***	5.6878
LNPK	0.4040***	5.0116	0.3625***	4.9282
LNPL	0.0628	1.4451	0.1090***	2.7478
LNTA	8.0935	0.6465	4.5665	0.3997
LNRISK	8.4219	0.6725	4.8617	0.4254
LNTLTA	0.1846	1.4120	0.2620**	2.1951
LNBR	0.3849***	1.5326	0.4256***	3.4053
LNGDP	0.3413	0.7624	1.1758***	2.8785
LNINF	-0.9590***	-31.5867	0.9850***	35.5522
H-Statistic		1.0053		0.9387
P-value H=0		0.0000		0.0000
P-value H=1		0.9072		0.1427

Source: Author's computation from Eviews 8

*Notes: t-statistics coefficients are in parenthesis; ***, **, * denote significance level at the 1%, 5% and 10% respectively.*

Chapter Five: Conclusion and Recommendations

5.1 Conclusion

This study investigates the trend, nature and degree of competition in Ethiopian banking over the period 2013-2017 applying both structural model and the Panzar - Rosse method. As structural models, calculated concentration ratio (CR) and Herfindahl-Hirschman Index (HHI) on total deposit, Loan and total Asset, during 2013-2017. The results of estimation CR and HHI imply that Ethiopian banking sector is moderately concentrated but the concentration indicators are reducing from time to time. To assess the degree of competition in Ethiopian banking industry, a modern empirical analysis based on the non-structural method developed by Panzar and Rosse (1987) was conducted by using quarterly panel data covering all private banks over five years (2013-2017). Panel regressions with fixed effects were used to calculate the Panzar-Rosse H statistic. The H-statistic is estimated using both interest revenue and total revenue as dependant variables. The result from the PR-estimate indicates banks in Ethiopia earned their revenue under the condition of a perfect competitive market structure. The equilibrium test results confirm that the market is in long-run equilibrium as the null hypothesis of E=0 is not rejected. The value of estimated H-statistic is higher in the total revenue based regression than the interest revenue based regression. This indicates there is lower competition among banks in interest revenue segment of the market, that means, banks in Ethiopia have not engaging in price competition. This result confirms the result of Zerayehu et al. (2013), who found competition in terms of price, is weak in Ethiopian. However; this result is contradicted with the finding of Zemzem and Gashaw (2014).

Bank revenue highly explained by price of fund (PF) than other input prices, From Bank specific control variables, BR (branch network) contributes highly significant effect on bank revenue in Ethiopian banking industry in the sample period. This confirms the decision of NBE is accurate, that has a big concern for branch expansion according to GTP II. On other hand, the size and risk have not significant effect on bank revenue. Generally, the result indicates all: three input prices, macroeconomic and bank specific variables except asset and risk have significant effect on interest revenue. However, only price of fund, price of labor, branch and inflation have

significant effect on total revenue. As expected, except inflation all variables have direct relation on both revenues. Unexpectedly inflation positively correlated with total revenue of bank.

The PR result in this study also support the structural argument that concentration is not a proxy of market structure, and it is consistent with the findings of Classen and Leaven (2004), Casu and Girardone (2004), Yildirum (2003), Zemzem and Gashaw(2014) who conclude that there is no significant relationship between competition and concentration. Unusually, the overall result of the estimation reveals that the Ethiopian banking market is characterized by perfect competition, different from the results found by several studies in developing and developed countries.

5.2 Recommendation

Based on the finding and the conclusion provided the following recommendations are forwarded:

- Result indicates that even though the market exhibits perfect competitive tendencies show by H-statistics, there is lower competition among banks in interest revenue segment of the market. This implies that price competition is week. Hence, the Ethiopian banking system need to give due emphasis to price competition that is in terms of interest rate.
- Even though competition level has been improved, Banks should protect from risk which may comes from high competitiveness.
- As per the result branch networking have statically significant effect in Ethiopian banking sector, therefore, Banks are advised to expand their branch network according to GTP II to be more competitive.
- Strengthening of the regulatory body (NBE) is also one important area that should be given attention. The capacity of supervisory authority to properly monitor and supervise the competition among banks in order to protect the banking sector from biased competition.

Reference

- Abdelkader, I.B., & Mansouri, F. (2013). Competitive conditions of the Tunisian banking industry: an application of the Panzer-Rosse model. *African development review, 25(4), 426-536).*
- *Abel,S., & Le Roux, P.(2016).* Assessing banking sector competition in Zimbabwe using a Panzer-Rosse Approach (no.599).
- Aljoša Babić, Emir Zildžović & Dragan Lončar(2015). Testing for Competition in Serbian Banking Industry: the Panzar-Rosse Approach. *Industrija, Vol.43, No.3, 2015.*
- Al-Muharrami, S., Matthews, K., & Khabari, Y. (2006). Market structure and competitive conditions in the Areb GCC banking system. *Journal of banking & Finance, 30(12), 3487-3501.*
- Baumol, W.J. (1986). Contestable markets: an uprising in the theory of industry structure. *Microtheory:applications and origins,40-54.*
- Bikker A.Jacob, Laura Spierdijk and Paul Finnie (2007). The impact of market structure, contestablity and institutional environment on banking competition, *Utrecht School of economics ,Tjalling C. Koopmans Research Institute, Discussion Paper Series 07-29.*
- Jacob A. Bikker and Katharina Haaf (2002). Competition, concentration and their relationship: An empirical analysis of the banking industry. *Vol. 26, issue 11), pp 2191-2214.*
- Brooks, C. (2014). Introductory econometrics for finance. *Cambridge university press.*
- Carol Ann Northcott. Competition in banking (2004). A Review of the Literature. *Bank of Canada W. P.*

- Casu,B., & Girardone, C.(2006). Bank competition, concentration and efficiency in the single European market. *The Manchester School, 74(4), 441-468.*

- Claessens, S. (2009). Competition in the financial sector: overview of competition polices. *The World Bank research Observer, 24(1), 83-118.*

- Claessens, S., & Leaven, L. (2004).What drives bank competition? Some international evidence. *Journal of Money, Credit, and banking, 36(3), 563-465.*

- *Delis,M.d. (2012). Bank* competition, financial reform and institutions: the importance of being developed. *Jurnal of development economics, 97(2), 450-465.*
- Doll,M. (2010). Bank concentration, competition and financial stability. Tilburg University, April –July 2010.

- Duncan, D., & Langrim, B. (2002). Testing for competition in the Jamaican banking sector: evidence from bank level data. *Financial Stability Department, Bank of Jamaica.*

- Farhad khodadad Kashi and Jamal Zarein Beynabadi (2013). The degree of competition in Iranian banking industry: Panzar-Rosse approach. *African Journal of Business* Management, *Vol. 7(43), pp. 4380-4385, 21 November, 2013.*

- Franklin Allen, Elena Carletti, Douglas Gale (2014). Money, financial stability & efficiency. *Journal of Economic theory. Vol. 149. Jan2014, pp.100-127.*

- Gaertner, M., & Sany,S. (2012). Assessing bank competition within the East African Community.

- Geda, A. (2006). The structure and performance of Ethiopia's financial sector in the pre- and post-reform period with a special focus on banking. *United Nations University (UNU), World Institute for Development Economics Research (WIDER).*

- Germi,E.(2015).Competition and Efficiency in Albanian Banking system. *In proceedings in GV-Global virtual conference (no.1).*

- George Owusu-Antwi& James Antwi (2013). Do Financial Sector Reforms Improve Competition of Banks? An Application of Panzar and Rosse Model: The Case of Ghanaian Banks? *International Journal of Financial Research, Vol. 4, No. 3; 2013.*

- Hair, J. and Black,W.(2006), Multivariate data analysis, New York, Prentice Hall.

- Hakam,A., Fatine,F.A., & Zakaria, F.(2014). Determinant of banking competition in morocco and evaluation of the structure reforms. *International journal of Economic policy in emerging economies, 7(3), 217-244.*

- Hamza, R. A. (2011). Validation Panzar-Rosse model in determining the structural characteristics of Tunisian banking industry. *Journal of economics and international finance, 3(5), 259-268.*

- Kamau, A. & Maureen, W., (2013). What drives banking sector performance in Kenya? *Global Business and Economics Research, 2(4), 45-59.*

- Kashi and Beynabadi (2013). The degree of competition in Iranian banking industry: Panzar-Rosse approach. *African Journal of Business Management. Vol. 7(43), pp. 4380-4385, 21 November, 2013.*

- Korsah, K. B., Nyarko, E. K., & Tagoe, N.A. (2001). Impact of financial sector liberalization on competition and efficiency in the Ghanaian banking industry. *In IFLIP research paper 01-2. International labor organization (ILO).*

- Levine, R. (1997). Financial development and economic growth: views and agenda. *Journal of economic literature, 35(2), 688-726.*

- Mirzaei, A., Moore, T. (2014) what are the driving forces of bank competition across different income groups of countries? *Journal of international financial markets, institutions and money, 32, 38-71.*

- Masood, O., & Aktan, B. (2010). The state of competition of the Turkish banking industry: an application of the Panzar-Rosse model. *Journal of business economics and management, (1), 131-145.*

- Maudos, J., & Solis, L. (2011). Deregulation, liberalization and consolidation of the Mexican banking system: Effects on competition. *Journal of international Money and Finance, 30(2), 337-353.*

- Michiel van Leuvensteijn, Christoffer Kok, Jacob Antoon Bikker & (2008). Impact of Bank Competition on the Interest Rate Pass-Through in the Euro Area. *BANCO DE ESPAÑA, Madrid, 2008 Documentos de Trabajo. N.º 0828.*

- Mohamed Amidu & John O.S Wilson (2014). Competition in African Banking: Do Globalization and Institutional Quality Matter? *University of St. Andrews, school of management, WP Nº 14-004.*

- NBE (1963). Proclamation No.206/1963: A Proclamation to provide for the regulation of monetary and banking system, Addis Ababa.

- NBE (1994). Proclamation No.83/1994: Monetary and Proclamation, Addis Ababa.

- NBE (1994). Proclamation No.83/1994: Banking Business Proclamation, Addis Ababa.

- NBE (1996). Directive no. SBB/12/1996: Limitation on investment of banks, licencing and supervision of Banking Business, Addis Ababa.

- NBE (2008). Proclamation No.591/2008: National bank of Ethiopia Establishment (as amended) Proclamation, Addis Ababa.

- NBE (2008). Proclamation No.592/2008: Banking business Proclamation, Addis Ababa.
- NBE (2011). Directive no. SBB/50/2011: Minimum paid up capital to be maintained by banks, Licensing and Supervision of Banking Business, Addis Ababa.
- NBE (2013). Directive no. SBB/55/2013: Reserve requirement (6th replacement), Licensing and Supervision of Banking Business, Addis Ababa.
- NBE (2015). Directive no. SBB/60/2015: Limitation on investment (as amended), Licensing and Supervision of Banking Business, Addis Ababa
- Nicola Cetorelli, 2001, Federal Reserve bank of Chicago.
- Panzar,J. C., & Rosse, J.N. (1987).testing for ''monopoly'' equilibrium. *The journal of industrial economics, 443-456.*
- Pruteanu-Podpiera, A., Weill, L., & Schobert, F. (2007). Market power and efficiency in the Czech Banking sector. *CNB.*
- Philip Molyneux,John Thornton & D Michael Llyod-Williams (1996). Competition and market contestability in Japanese commercial banking. *Journal of Economics and Business 1996.*
- Quarterly Bulletin, Fourth Quarter 2016/17.National Bank of Ethiopia. *www.nbe.gov.et.*
- Repkova, I., & Stavarek, D. (2013). Relationship between competition and efficiency in the Czech banking industry. *Acta Universitais Agriculturae et Silvculturae Mendelianae Brunensis, 61(7), 2701-2707.*

- Rima Turk-Ariss (2009). Competitive behavior in Middle East and North Africa banking systems. *The Quarterly Review of Economics and Finance, vol.49, issue 2, pp 693-710.*
- James R. Barth,Gerard Caprio,Ross Levine (2004). Bank regulation and supervision: what works best? *Journal of Financial Intermediation, vol.13, issue 2, pp 205-248.*
- Selvi ak Kocabay(2009). Bank competition and banking system stability: Evidence from Turkey.
- Simpasa, A.M. (2013). Competitive and Market structure in the Zambian banking sector.
- Sekmen, T., Akkus, O., & Siklar, I. (2015). Competitive conditions in the Turkish Banking Systems. *Journal of Business Economics and Finance, 4(1).*
- Zemzem A. & Gashaw D. (2014). Structural Competition of Banking Industry in Ethiopia. *Birritu, National bank of Ethiopia, vol.117, 18-31.*
- Zerayehu, S.E, Kagnew, W.T. & Teshome, K. A. (2013). Competition in Ethiopian Banking Industry. *African journal of economics, 1(5), 176-190.*

Appendixes

Appendix -1 Result of Panzar- Rosse Model

Dependent Variable: **LNIR**
Method: Panel Least Squares
Date: 12/13/17 Time: 10:41
Sample: 2013Q1 2017Q2
Periods included: 18
Cross-sections included: 16
Total panel (balanced) observations: 288

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPF	0.467137	0.082129	5.687846	0.0000
LNPK	0.362550	0.073566	4.928223	0.0000
LNPL	0.109057	0.039688	2.747826	0.0064
LNTA	4.566598	11.42367	0.399749	0.6897
LNTLTA	0.262007	0.119357	2.195148	0.0290
LNRISK	4.861782	11.42673	0.425475	0.6708
LNBR	0.425680	0.125004	3.405322	0.0008
LNINF	0.985032	0.027707	35.55223	0.0000
LNGDP	1.175892	0.408498	2.878573	0.0043
C	-25.83304	57.43361	-0.449790	0.6532

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.901191	Mean dependent var	-2.932582
Adjusted R-squared	0.892174	S.D. dependent var	1.013112
S.E. of regression	0.332674	Akaike info criterion	0.719495
Sum squared resid	29.10668	Schwarz criterion	1.037461
Log likelihood	-78.60735	Hannan-Quinn criter.	0.846917
F-statistic	99.94611	Durbin-Watson stat	1.874508
Prob(F-statistic)	0.000000		

Dependent Variable: **LNTR**
Method: Panel Least Squares
Date: 12/13/17 Time: 10:53
Sample: 2013Q1 2017Q2
Periods included: 18
Cross-sections included: 16
Total panel (balanced) observations: 288

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPF	0.538443	0.090003	5.982525	0.0000
LNPK	0.404030	0.080619	5.011602	0.0000
LNPL	0.062854	0.043493	1.445141	0.1496

LNTA	8.093506	12.51885	0.646506	0.5185
LNTLTA	0.184694	0.130800	1.412029	0.1591
LNRISK	8.421918	12.52220	0.672559	0.5018
LNBR	0.384987	0.136988	2.810365	0.0053
LNINF	-0.959063	0.030363	-31.58673	0.0000
LNGDP	0.341303	0.447661	0.762414	0.4465
C	-38.49521	62.93973	-0.611620	0.5413

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.892467	Mean dependent var	-3.491577
Adjusted R-squared	0.882654	S.D. dependent var	1.064249
S.E. of regression	0.364567	Akaike info criterion	0.902592
Sum squared resid	34.95508	Schwarz criterion	1.220557
Log likelihood	-104.9732	Hannan-Quinn criter.	1.030013
F-statistic	90.94838	Durbin-Watson stat	2.164478
Prob(F-statistic)	0.000000		

Appendix -2 Result of Wald test

Market Equilibrium Hypotheses test

Null Hypostasis: E1+E2+E3=0
(2013-2017)
Wald Test:
Equation: **lnROA**

Test Statistic	Value	df	Probability
t-statistic	1.121486	263	0.2631
F-statistic	1.257730	(1, 263)	0.2631
Chi-square	1.257730	1	0.2621

Null Hypothesis: C(1)+C(2)+C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) + C(2) + C(3)	0.088307	0.078741

Restrictions are linear in coefficients.

Wald Test:
Equation: **lnROE**

Test Statistic	Value	df	Probability
t-statistic	1.279046	263	0.2020
F-statistic	1.635959	(1, 263)	0.2020
Chi-square	1.635959	1	0.2009

Null Hypothesis: C(1)+C(2)+C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) + C(2) + C(3)	0.067742	0.052963

Restrictions are linear in coefficients.

Banking competition hypothesis tests

Null Hypostasis 1: H1+H2+H3=0
Null Hypostasis 1: H1+H2+H3=1
(2013-2017)

Wald Test:
Equation: **lnIR**

Test Statistic	Value	Df	Probability
t-statistic	22.53166	263	0.0000
F-statistic	507.6758	(1, 263)	0.0000
Chi-square	507.6758	1	0.0000

Null Hypothesis: C(1)+C(2)+C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) + C(2) + C(3)	0.938745	0.041663

Restrictions are linear in coefficients.

Wald Test:
Equation:**lnIR**

Test Statistic	Value	Df	Probability
t-statistic	-1.470245	263	0.1427
F-statistic	2.161621	(1, 263)	0.1427
Chi-square	2.161621	1	0.1415

Null Hypothesis: C(1)+C(2)+C(3)=1

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-1 + C(1) + C(2) + C(3)	-0.061255	0.041663

Restrictions are linear in coefficients.

Wald Test:
Equation: **lnTR**

Test Statistic	Value	Df	Probability
t-statistic	22.01884	263	0.0000
F-statistic	484.8293	(1, 263)	0.0000
Chi-square	484.8293	1	0.0000

Null Hypothesis: C(1)+C(2)+C(3)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1) + C(2) + C(3)	1.005327	0.045658

Restrictions are linear in coefficients.

Wald Test:
Equation: **lnTR**

Test Statistic	Value	df	Probability
t-statistic	0.116679	263	0.9072
F-statistic	0.013614	(1, 263)	0.9072
Chi-square	0.013614	1	0.9071

Null Hypothesis: C(1)+C(2)+C(3)=1
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
-1 + C(1) + C(2) + C(3)	0.005327	0.045658

Restrictions are linear in coefficients.