Addis Ababa University

College of Business and Economics

Department of Economics

The Impact of Industry Concentration on Performance of the Ethiopian Banking Industry

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A thesis submitted to the College of Business and Economics of Addis Ababa University in partial fulfillment for the Degree of Master of Science in Financial Economics

February, 2025

Addis Ababa, Ethiopia

DECLARATION

The researcher hereby declares that the thesis titled *"**The Impact of Industry Concentration on Performance of the Ethiopian Banking Industry**"* is an original work. All sources that have been referred to and quoted have been duly indicated and acknowledged with complete references.

Signature

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Addis Ababa, Ethiopia
February, 2025

CERTIFICATION

This is to certify that the thesis prepared by Addisu Habte Berta, titled "The Impact of Industry Concentration on Performance of the Ethiopian Banking Industry" and submitted in partial fulfillment of the requirements for the degree of Master of Science in Financial Economics, complies with the regulations of the University and meets the accepted standards concerning originality and quality.

Advisor: Worku Gebeyehu (Ph. D.) Signature  Date 14 October 2024

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DEPARTMENT OF ECONOMICS

COLLEGE OF BUSINESS AND ECONOMICS

ADDIS ABABA, ETHIOPIA

ACKNOWLEDGEMENTS

First and foremost, I am deeply grateful to the Almighty God and His mother, Saint Mary, for their endless blessings, grace, and strength throughout this journey. Without their divine support, this accomplishment would not have been possible.

I extend my sincere gratitude to my advisor, Worku Gebeyehu (Ph.D.), for his invaluable guidance, patience, and insightful feedback throughout this thesis. His expertise and encouragement have been pivotal in shaping my work.

I am also thankful to the professors in the Department of Economics at Addis Ababa University for their knowledge, mentorship, and dedication. Their contributions have been vital to my academic growth.

Last but not least, I am profoundly thankful to my family and colleagues for their unwavering support, encouragement, and understanding during this challenging but rewarding journey. Their love and motivation kept me moving forward.

ABSTRACT

This study examines the impact of industry concentration on the performance of the Ethiopian banking industry. The primary research question revolves around the impact of market concentration and relative market share versus bank efficiency in determining profitability and operational outcomes. Key performance metrics, including Return on Assets (ROA) and Net Interest Margin (NIM), were analyzed through a system Generalized Method of Moments (GMM) regression approach using Stata software Version 15. Additionally, MaxDEA Software was employed to compute efficiency scores, particularly technical, scale, and management efficiency, for each bank. The findings reveal that market concentration, represented by the Herfindahl-Hirschman Index (HHI), has a positive and significant effect on both ROA and NIM. This suggests that more concentrated markets enable higher profitability and wider interest margins, which supports elements of the Structure-Conduct-Performance (SCP) hypothesis. However, the negative and significant relationship between market share and bank performance calls into question the validity of the Market Power Hypothesis (MPH), implying that while larger banks enjoy some collusive advantages, individual market share does not necessarily translate into higher performance. From an efficiency standpoint, the results indicate that neither technical efficiency nor scale efficiency has a statistically significant impact on profitability, which challenges the Efficiency Structure Hypothesis (ESH). Interestingly, management efficiency demonstrates a positive and significant influence on both ROA and NIM, underscoring the importance of sound management practices in the banking sector. This research contributes to the ongoing debate about the drivers of bank performance in emerging markets, offering evidence that market concentration and managerial efficiency play crucial roles in shaping outcomes, while technical and scale efficiency are less decisive. The study emphasizes the need for enhanced competition and improved managerial practices within the Ethiopian banking industry to foster sustainable growth and profitability.

Key words: *Structure, conduct, performance, bank, efficiency, concentration, DEA*

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List of Acronyms

AIB	Awash International Bank S.C.
ATMs	Automated Teller machines
BOA	Bank of Abyssinia S.C.
CAR	Capital Adequacy Ratio
CBE	Commercial Bank of Ethiopia
CBO	Cooperative Bank of Oromia S.C
CR	Concentration Ratio
DB	Dashen Bank S.C.
DBE	Development Bank of Ethiopia
DGB	Debub Global Bank S.C
DUM	Dummy Variable
ESH	Efficient Hypothesis
GDP	Growth Domestic Product
HHI	Herfindahl-Hirschman Index
IMF	International Monetary Fund
IO	International Organization
LIB	Lion International Bank S.C.
MS	Market Share
NBE	National Bank of Ethiopia
NIB	Nib International Bank S.C.
NIM	Net Interest Margin
OIB	Oromia International Bank S.C
RGDP	Real Gross Domestic Product
RMP	Relative Market Power Hypothesis
ROA	Return on Asset
ROE	Return on Equity
SCP	Structure Conduct Performance
USD	United States Dollar
WB	Wegagen Bank S.C.
ZB	Zemen Bank S.C.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The performance of financial institutions and the economy are closely and directly related. The financial services industry's performance has an impact on the economy in many ways, including the development of the nation as a whole, businesses, and individuals (Marcan, 2012). In a financial system, banks serve crucial functions across various areas, including providing financing, facilitating payment systems, transmitting monetary policy, and offering credit (Kashi, 2013). On the other hand, regulatory bodies also impose heavy regulations and standards governing the financial well-being of the banking industry (Sibindi, 2018).

This dynamic is particularly relevant to Ethiopia, where the banking industry serves as the backbone of the financial system and plays a pivotal role in the national economy. Banks constitute approximately 87 percent of the financial sector's total capital and contributed 3.2 percent to the national economy in 2022 (NBE, 2022). Proclamation 592 of 2008 highlights that banks in Ethiopia are vital for economic growth, raising capital from both domestic and foreign sources to distribute across various sectors. The structure and operation of the banking industry are thus critical for ensuring financial stability and fostering economic development (Sibindi, 2022).

The Ethiopian banking sector has undergone substantial reforms, particularly following the enactment of Proclamation No. 84/1994, which allowed private banks to enter a market previously dominated by government institutions. This legislation catalyzed the emergence of numerous private banking companies (Alemayehu, 2010). The introduction of private banks has diversified the sector, enhanced operational efficiency, and increased competitiveness.

As of June 2022, Ethiopia had 31 banks, 29 of which were privately owned, while the remaining two were government-owned (one development bank and one public commercial bank). The total branch network reached 8,944, with private banks accounting for 76.1 percent of these branches (NBE, 2022). However, there were still 12,000 people per branch, indicating significant room for expansion. The total capital of the banking sector rose to Birr 199 billion during the same period.

Market concentration is notable within the Ethiopian banking industry. The top four banks, including the Commercial Bank of Ethiopia (CBE), Awash Bank, Dashen Bank, and Bank of Abyssinia, held 51 percent of the total capital in the industry as of June 2022, with CBE alone accounting for about one-third (NBE, 2022). This concentration raises critical questions about its implications for bank performance, a topic that has spurred theoretical and empirical debates globally.

Two competing frameworks from traditional industrial organization theory the Structure-Conduct-Performance (SCP) hypothesis and the Efficient Structure hypothesis (ESH) have been used to explore the link between market concentration and performance. The SCP hypothesis

posits that market structure determines firm conduct, including pricing and investment strategies, which subsequently affect financial performance. Mateev M, Usman Tariq M, Sahyouni A (2023) findings support this hypothesis, suggesting a positive relationship between bank profitability and market concentration in multiple regions.

Conversely, the Efficient Structure Hypothesis (ESH) posits that efficiency, rather than market concentration, is the primary driver of market share and profitability. Kozak and Wierzbowska (2021) explore this relationship by analyzing data from 150 banks operating between 2005 and 2019 across 11 EU and 8 non-EU countries. Their findings indicate that banks tend to align with the principles of the Efficient Structure Hypothesis.

While the debate continues, existing literature lacks consensus on whether concentration enhances or diminishes bank performance. Given the strategic importance of Ethiopia's banking industry for national development, this study aims to investigate the interplay between market concentration and performance, addressing gaps in the existing literature and offering insights relevant to policymakers and industry stakeholders.

1.2 Statement of the Problem

The relationship between bank performance and market structure has been the subject of ongoing debate among researchers and policymakers. On one side, studies argue that market concentration positively influences profitability by enabling firms to exercise greater market power. For example, Evanoff and Fortier (1988) and Gilbert (1984) suggest that changes in market concentration directly affect a firm's financial performance. Bourke (1989) supports this view, finding a positive relationship between bank profitability and market concentration in Australia, Europe, and North America.

On the other hand, opposing evidence highlights the role of efficiency rather than concentration in driving profitability. Smirlock (1985), in his extensive study of 2,700 state banks in the United States, found that market concentration does not explain bank profitability. Similarly, Goldberg and Rai (1996), in their research on large banks across eleven European countries from 1988 to 1991, reported no significant positive relationship between concentration and performance. These conflicting findings underscore the need for further investigation, particularly in specific contexts like Ethiopia, where the banking sector exhibits unique characteristics.

Despite the importance of this issue, only a limited number of studies have explored the relationship between market structure and bank performance in the Ethiopian banking industry. Prior research, such as Eshetu (2010), Tesfaye (2013), Sori (2014), Abdulwali (2018), and Yalemselam (2018), has predominantly focused on private commercial banks, neglecting government-owned banks. This omission is significant, as government-owned banks account for over half of the industry's market share. Additionally, most existing studies analyze data from periods that predate significant recent developments in the Ethiopian banking sector.

Consequently, there remains a critical gap in understanding how both private and government-owned banks perform in a more contemporary and comprehensive context.

This study seeks to address these gaps by including both private and government-owned banks in its analysis. By examining data spanning eleven years (2013 to 2023 G.C.) from audited financial statements and NBE's annual reports, this research offers a broader and more current perspective. Adopting a deductive research approach and employing balanced panel data, the study aims to provide a thorough understanding of how industry concentration impacts the performance of Ethiopian commercial banks. In doing so, it contributes valuable insights for practitioners, policymakers, and researchers, while addressing the unresolved theoretical debate on market concentration and performance.

1.3 Research Objectives

1.3.1 General Objective of the Research

The general objective of this research is to assess how industry concentration influences the performance of the Ethiopian banking sector.

1.3.2 Specific Objectives of the Research

As a way to grasp the aforementioned primary objective, the study dwelled on the following specific objectives;

- Examining the impact of market structure on the performance of Ethiopian banking firms;
- Investigating the impact of bank-specific and macroeconomic factors on bank performance.
- Evaluating the performance of Ethiopian banks concerning the existing industry structure, and other influencing factors and asses the results in connection with the SCP hypothesis predictions;

1.4 Research Questions and Hypotheses

1.4.1 Research Questions

To achieve the objective listed above, the following questions would be the focus of the research;

- How does industry concentration affect the performance of banking firms in Ethiopia?
- What impact do bank-specific factors and macroeconomic variables have on the performance of banks in Ethiopia?
- How does the performance of Ethiopian banks align with the predictions of the SCP hypothesis, given the current industry structure and influencing factors?

1.4.2 Hypothesis of the study

Drawing from the existing empirical literature on the impact of industry concentration on the performance of the Ethiopian banking sector, this study proposes the following working hypothesis:

Hypotheses 1

H_0: Market concentration has no impact on the performance of Ethiopian banks.

Hypotheses 2

H0: Market share does not affect the performance of banks in Ethiopia.

Hypotheses 3

H_0: Efficiency does not affect the performance of Ethiopian Banks.

Hypotheses 4- Bank specific factors

H_0: Bank-specific factors do not affect the performance of Ethiopian Banks.

Hypothesis 5- Macroeconomic factors

H_0: Macroeconomic factors do not affect the performance of Ethiopian Banks.

1.5 Significance of the Study

This research provides critical insights into the relationship between market structure, banking efficiency, and the performance of the Ethiopian banking sector based on comprehensive empirical data analysis. The findings contribute significantly to the existing body of literature and offer practical implications for a variety of stakeholders:

- **Policymakers and Regulators:** The study offers evidence-based recommendations to refine policy decisions and regulatory frameworks aimed at improving banking efficiency and performance in Ethiopia.
- **Banking Industry Professionals:** By identifying key areas for improvement in market structure and operational efficiency, the research delivers actionable insights to enhance bank performance.
- **Future Researchers:** The findings serve as a valuable reference point for further exploration of the Ethiopian banking sector, emphasizing unresolved questions and areas needing deeper investigation.
- **Academics and Educators:** The study's results enrich academic discussions on banking and financial systems, serving as a resource for teaching and further academic inquiry.

1.6 Scope of the study

This study focuses on the performance of banks established solely for commercial or profit-oriented purposes. Banks engaging in non-commercial activities are excluded from the analysis. The research covers an eleven-year period, from 2013 to 2023 G.C., to ensure sufficient data availability. The inclusion criteria are based on operational and financial records, which newer banks that entered the market within the last three years typically lack. Additionally, the study

examines specific factors influencing the profitability of banks, including bank-specific elements, the banking industry structure, and the Ethiopian macroeconomic environment.

1.7 Limitation of the Study

The study does not extend to comparisons with regional and global banks or other institutions within the Ethiopian financial system. It is confined to analyzing the Ethiopian banking sector within the defined parameters and does not explore broader international or cross-industry perspectives. These limitations highlight the focused nature of the research, which aims to provide targeted insights into the Ethiopian context.

1.8 Organization of the Study

The remaining part of the thesis is organized as follows. Chapter 2 discusses the pertinent theoretical and empirical literature as a foundation for the study. This chapter also covers the definition of market structure and an explanation of the key terms. Chapter 3 presents a snapshot of the methods and procedures including the research and sampling design, study approach, data source and type, model specification, data analysis methods, and variable descriptions and measurements. Chapter 4 presents empirical findings and their implications. Chapter 5 concludes the study by presenting the main findings, and their policy implications.

CHAPTER TWO: LITERATURE REVIEW

2.1 General overview of the Market structure

Defining the relevant market is a prerequisite for conducting a market structure analysis. Being involved in the deposit, loan, and securities markets, banks are typically multiproduct companies. The products available in each market are not all the same because of varying supply-side activities and factor inputs as well as demand-side preferences. Consequently, the loan and deposit markets exhibit structural segmentation based on either customer groups or bank products. The submarkets of financial services (large corporate clients) and retail banking (small and medium-sized businesses and households) are implied by a segmentation based on customer groups (Goodwin, 2020).

Regarding the importance of information searching, the level of risk aversion, and the requirement for liquidity, consumer preferences vary. Bank product segmentation gives rise to loan submarkets, encompassing mortgage, corporate, and consumer loans, as well as deposit submarkets, comprising demand, time, and savings deposits. These goods, which meet similar needs (like liquidity, safety, and profitability) and are closely linked through substitutability, define this market. Their fundamental features (deposit books, credit cards, etc.) tend to be similar but their qualities (branch networks, ATMs, e-banking, etc.) or images set them apart (Zegeye, 2016).

Finding the market's geographic reach comes next after a product market has been defined. Information costs, in addition to transportation costs, limit the relevant market area for retail banking products that require a lot of information. As a result, the traditional approach to characterizing the retail banking market assumes that the main suppliers of financial services are neighborhood commercial lenders. It is considered that the costs of information and transportation would be prohibitive if customers sought out and used the services of distant banks, or if banks evaluated a non-local company applying for credit (Elliehausen & Wolken, 1990)

It refers to those features of a market's structure that seem to have a strategic influence on the kinds of pricing and competition that exist there, according to Bain (1959). The author proposed the following four essential elements of the market structure, which are critical for measuring and understanding the concept.

- The market's distribution of companies based on the size and quantity that produce a specific commodity or group of commodities is known as the degree of seller's concentration.
- The level of buyer concentration indicates the distribution of buyers' sizes and numbers for the commodities in the market.
- The level of product differentiation: This shows the differences between the products that different businesses in the market offer.

- The requirement for entering the market: This indicates how simple it is for new businesses to become sellers (i.e. in the marketplace).

Each of these four unique market structure dimensions or features had an impact on the behavior of the firms, which in turn affected their performance and the industry's overall performance. When there is just one firm, there is a monopoly market; when there are two, there is a duopoly; when there are a few, there is an oligopoly; and when there are "many" firms, there is an atomistic market. Each scenario will require a different approach to be taken to determine the output and price. Analyzing the sellers' absolute sizes will reveal another facet of the market structure (Ibid, 1959).

2.2 Overview of the banking system in Ethiopia

Ethiopian banking history began on February 15, 1906, when Emperor Menelik II inaugurated the first Bank of Abyssinia. This private institution traded its shares in major cities such as Addis Ababa, New York, London, Paris, and Vienna. A significant transformation occurred under Emperor Haile Selassie in 1931 when the government liquidated the Bank of Abyssinia and the newly established Bank of Ethiopia took over its assets, personnel, and management, serving as both the commercial and central bank of the nation.

During the Italian occupation from 1936 to 1941, the banking sector saw considerable expansion, with Italian banks playing a prominent role. Most banks remained operational during this period. Following World War II, British strategic efforts were crucial in restoring Ethiopia's independence from Italy. In this context, Barclays Bank was established and began operations between 1941 and 1943. The State Bank of Ethiopia, founded in 1942, was later divided in 1963 into the National Bank of Ethiopia (NBE), which serves as the central bank, and the Commercial Bank of Ethiopia (CBE).

In a gradual approach to reform, the Ethiopian government began allowing private banks and insurance companies alongside public institutions. The Banking Proclamation of 1994 established regulations that restricted foreign nationals from engaging in banking activities within the country. Over the years, the minimum capital requirement for establishing a new bank has been significantly raised, limiting the entry of new players into the market and resulting in a concentration of banking services among a few institutions, predominantly state-owned banks.

Currently, the Ethiopian banking landscape consists of thirty banks, with two being publicly owned and twenty-eight privately owned, reflecting a diversification in ownership. The sector has experienced substantial growth, as evidenced by the increase in bank branches from just 203 in June 1991 to 8,944 by June 2022, enhancing the accessibility of banking services.

The National Bank of Ethiopia plays a crucial role in regulating the banking sector, and implementing various policy measures aimed at improving efficiency and stability. These measures include reforms related to interest and exchange rates, as well as the introduction of financial instruments such as treasury bills and an interbank money market. The NBE regulates

the minimum deposit rate, currently set at 7 percent, while loan interest rates are allowed to fluctuate based on market conditions. However, inflationary pressures have led to negative real deposit interest rates in recent years. Additionally, the NBE Directive number SBB/78/2021 raised the minimum paid-up capital requirement for banks from ETB 500 million to ETB 5 billion, giving new banks seven years and existing banks five years to comply.

The regulatory framework in the Ethiopian banking sector is characterized by stringent controls aimed at protecting depositors' funds, ensuring system stability, and influencing lending practices to positively impact the economy. However, these regulations can also stifle competition and hinder the efficiency and performance of banks. In terms of market share, state-owned banks dominate, with private banks' asset share capped at 52%. The Commercial Bank of Ethiopia holds a commanding position, accounting for over 53% of total bank deposits, 30% of bank loans, and 31% of total capital.

Ethiopian banking began on February 15, 1906, when Emperor Menelik II officially opened the first Bank of Abyssinia. This private bank traded its stock in Addis Ababa, New York, London, Paris, and Vienna. Under Emperor Haile Selassie, the banking system changed in 1931. Following its liquidation, the government-owned Bank of Ethiopia acquired control of the Bank of Abyssinia's assets, personnel, and management. Services for the commercial and central banks of the country were provided by the Bank of Ethiopia.

During the five years of Italian occupation (1936–1941), the banking sector expanded. Italian banks were highly engaged. At the time, most of the banks were open for business. Britain's strategic planning during World War II was instrumental in helping Ethiopia achieve independence from Italy's brief occupation. There, between 1941 and 1943, Barclays Bank was established and operated (Geda A. , 2008). Founded in 1942, the State Bank of Ethiopia (NBE) was split into the National Bank of Ethiopia, the Central Bank, and the Commercial Bank of Ethiopia (CBE) in 1963.

Following a gradualist approach, the Ethiopian government opened up private insurance companies and banks in addition to public ones (Ibid, 2008). Accordingly, the Ethiopian banking system has been governed by the Banking Proclamation of 1994, which implemented restrictions on foreign nationals from undertaking banking business in the country. Additionally, the minimum capital required to establish a new bank has been significantly increased over the years, which has limited the entry of new banks into the market. As a result, there has been a concentration of banking services among a few banks, with state-owned banks holding a dominant position (Ijara & Sharma, 2020).

Nevertheless, as part of the ongoing financial sector reform, the commercial banking ecosystem in Ethiopia currently comprises a total of thirty banks. Among these, two are publicly owned, while the remaining twenty-eight are privately owned banks (NBE, 2022). This signifies a diversification in ownership within the banking sector.

Over the years, there has been a substantial expansion in banking activities, as evidenced by the increase in the number of bank branches. In June 1991, the number of bank branches was as low as 203, but by June 2022, it had risen to 8,944, indicating significant growth in the reach and accessibility of banking services (Ibid,2022).

The National Bank of Ethiopia (NBE) has a vital role in regulating the banking sector and has implemented several policy measures to improve the efficiency and stability of the industry. These measures encompass reforms related to interest rates and exchange rates, as well as the introduction of financial instruments like treasury bills and an interbank money market. One of the areas regulated by the NBE is the minimum deposit rate, which is currently set at 7 percent. On the other hand, loan interest rates are allowed to fluctuate based on market conditions. However, due to inflationary pressures, the real deposit interest rates have been negative in recent years. Besides, the minimum paid-up capital requirement for banks was raised from ETB500 million to ETB5 billion by the NBE Directive number SBB/78/2021. New banks have seven years to comply with the new standard while existing banks have five years.

The regulatory environment in the Ethiopian banking sector is characterized by high levels of control and regulation. This is done to protect depositors' funds, ensure the stability of the banking system, and influence lending practices to have a positive impact on the economy. However, these regulations can also impede competition and hinder the efficiency and performance of banks (Semu, 2010).

In terms of market share, state-owned banks dominate considering the market share of private banks in terms of assets is capped at 52% (Million, 2023). While, the Commercial Bank of Ethiopia (CBE) maintains a dominant position in the banking sector, holding over 53 of total bank deposits, 30% of bank loans, and 31% of the total capital.

2.3 Theoretical Literature Review

In conventional industrial organization theory, there are two competing theories: the Structure, Conduct Performance (SCP) hypothesis and the Efficient Structure hypothesis (ESH). These conflicting theories are used to study the relationship between concentration and competition in the banking sector. While SCP maintains that greater market concentration leads to less competition and higher profits for the participating firms, ESH takes efficiency into account and states that firms with higher efficiency increase their market shares and profitability (Abbasoglu, 2007). One of the theories about industrial organizations that has been tested the most is the SCP (Sinkey, 1986).

2.3.1 The SCP Paradigm; hypothetical Model

The Structure-Conduct-Performance (SCP) paradigm, first introduced by Mason in 1937 and later elaborated by Bain in 1959, serves as a theoretical framework for examining the interplay between market structure, the behavior of firms, and overall market performance. Within this framework, market concentration is viewed as both a measure and a contributing factor to market power. Concentration refers to the degree to which a limited number of firms account for a

significant portion of an industry's output, establishing a direct connection between market structure and performance through the actions of firms.

Market concentration is frequently utilized as a key indicator of market structure, with various metrics employed to assess it. Notable among these are the Herfindahl-Hirschman Index (HHI) and concentration ratios, which are commonly applied in the analysis of the banking sector. According to the SCP model, when banks operate in a concentrated market, their ability to exert market power increases, particularly when they engage in collusion. However, the extent of this market power is constrained if the demand for banking services is elastic, even in scenarios of perfect collusion, Courvoisier and Groppe (2002).

The HHI and concentration ratios are the primary tools for measuring market concentration (Ross, 1990) (Morris, 1984). The HHI quantifies the market share held by a small number of banks concerning total assets, loans, or deposits. It is calculated by summing the squares of the market shares of all banks within the market, yielding a value between 0 and 1. A value of 0 indicates a highly competitive market with many small banks, while a value approaching 1 signifies a market dominated by a few large banks. Thus, the HHI serves as a critical indicator of the level of concentration within the banking industry.

A decrease in the HHI generally signifies an increase in competition and a reduction in pricing power, while an increase in the HHI indicates the contrary. Based on the previously discussed theory, the HHI can be calculated in the following manner:

$$HHI = \sum [y_i/y]^2$$

Where, y_i indicates the overall assets, deposits, or credits of bank i, and the corresponding y equals the overall assets, deposits, or credits of all banks in the industry. For each bank, one can calculate $[y_i/y]^2$ as a measure of concentration. The HHI is particularly responsive to the quantity and size distribution of service providers, making it a more precise measure of market concentration.

Concentration ratio (CR_k), which is defined as follows, is another commonly used concentration measure:

$$CR_k = \sum_{i=1}^{k} Si = S1 + S2 + \cdots + Sk$$

Banks are ranked according to their market share, with the largest bank positioned first. The CRk metric ranges from 0 to 1, where a value closer to 0 indicates low bank concentration, while a value approaching 1 signifies high concentration. This metric represents the market share of the top k banks, with the selection of k based on the available data. CRk focuses solely on larger institutions and carries a clear interpretation.

The Structure-Conduct-Performance (SCP) framework was developed by economists in the Industrial Organization, inspired by Bain's work on the relationship between profit rates and

industry concentration during the years 1936-1940. The foundational idea is that higher concentration can lead to collusion or non-collusive behavior, resulting in increased prices and enhanced profitability. The SCP model posits that the structure of a market influences the behavior of firms, which in turn impacts market performance. Essentially, the unique attributes of a market dictate firm behavior, and this behavior ultimately influences the market's performance outcomes.

The traditional SCP model suggests that certain market structures promote monopolistic behavior, enabling banks to set prices above marginal costs and achieve excessive profits. As a result, the pricing strategies employed by banks act as a link between market structure and profitability. Competition theorists argue that firms in highly concentrated sectors may avoid reducing lending rates or increasing deposit rates, leading to a lack of competition among them (Morris, 1984). This scenario would result in profitability exceeding the average. The prevailing assumption is that greater concentration correlates with enhanced monopolistic performance. Theoretically, the model suggests that firms in perfectly competitive markets with highly elastic demand will experience lower profitability compared to those in markets with less elastic demand (George, 1970).

2.3.2 Components of the (SCP) Framework

The SCP model has garnered both acclaim and criticism throughout its history. It serves as a valuable framework for analyzing the interplay between market structure, firm behavior, and performance. However, some detractors contend that the model oversimplifies the intricate dynamics of actual markets and overlooks significant elements such as technological advancements, consumer preferences, and regulatory influences. Despite these criticisms, the SCP model has played a pivotal role in the field of industrial organization, laying the groundwork for empirical studies examining the impact of market structure on industry performance.

A. Market Structure

From a theoretical perspective, market structure serves as a framework for categorizing the key attributes of a market, including the number of firms, the homogeneity of the products they provide, and the barriers to entry and exit (Tucker, 2010). (Salvatore, 1998) identifies four distinct types of market organizations: at one end is monopoly, at the other is perfect competition, with monopolistic competition and oligopoly positioned in between. Shepherd (1985) introduced the concept of the dominant firm, characterized as a company that commands 50–100% of the market share with minimal competition. He further classified oligopoly into two segments: loose oligopoly, where the top four firms control less than 40% of the market, and tight oligopoly, where they collectively hold between 60–100%. The banking market structure is exemplified by the presence of numerous smaller, local banks forming a fringe group alongside a few large dominant banks, which together account for over half of the deposits in a specific metropolitan area (Astrid A., 2002). Consequently, a critical question arises regarding how variations in market structure influence firm performance (Mason, 1937). Bain emphasized that

the essential elements of market structure include the size of firms, the concentration of sellers and buyers, and the conditions for market entry (Bain J. S., 1968).

The extent of market concentration is directly related to its proximity to a monopoly structure. A market exhibits more monopolistic characteristics as concentration increases (ibid, 1968). Mohamed characterizes a concentrated market as one where market shares are distributed unevenly or where only a few firms participate in production (Mohamed, 2013). As the concentration within an industry rises, so does the degree of monopoly and the reduction of competition (Weiss, 1971). Conversely, a low concentration level indicates that leading companies possess less market power, which restricts their ability to raise prices significantly above competitive levels (Van Hoose, 2009). Consequently, when a single producer or a small group of producers holds substantial market power, they can set prices above marginal costs, as indicated by research in industrial organizations.

In summary, various factors influencing market power and competition levels are crucial in defining market structure. This suggests that the structural elements play a strategic role in determining pricing and competitive dynamics within the market. Therefore, a company's strategies should be aligned with the characteristics of the market (Weiss, 1978). This alignment will directly affect the performance of firms within the industry. Thus, a comprehensive understanding of market structure is essential for predicting the behavior of companies in the sector. This perspective is also supported by other scholars, including Dahl and Hamxond (1977) and George and Singh (1970).

B. Conduct

Firm conduct refers to the actions and strategies adopted by individual firms within a given market structure. It includes aspects like pricing decisions, advertising and promotional activities, research and development investments, and competitive behavior (Wang, 2010). Market conduct includes a variety of strategies used by traders to draw clients to their organization. (Moore (1973).

Conversely, Purcell (1973) described market conduct as the actions and behaviors of companies operating within the designated structure. Among the activities of market conduct are pricing policies, selling costs, and non-price competition. Consequently, the behavior of companies within an industry resembles market conduct. It includes a range of decision-making strategies for choosing output, price, and sales promotion plans, among other strategies, to meet their financial objectives (Grigorova, 2008). Furthermore, the behavior of firms is influenced by the characteristics of the market, which in turn affects their performance. The SCP paradigm assumes that conduct is directly impacted by the structure of the market (Bain J. S., 1956).

On the other hand, there is a strong belief that a company's actions can affect the structure of the market. Likewise, the merger process can alter the market structure due to the actions of firms. Different mergers vertical, horizontal, or conglomerate have varying effects on the market's structure. This is due to the possibility that company mergers could boost market power by raising industry barriers to entry or market share (Shepherd and Willcox, 1979). A horizontal merger, as noted by Shapherd and Willcox (1979), leads to an increase in market concentration, a reduction in competitive dynamics, and an enhancement of the market power held by the companies involved, particularly in terms of their pricing strategies. This leads one to conclude that conduct, in addition to structure, defines performance. Therefore, the conduct of a firm has the power to alter the market structure.

C. Performance

The market performance, which constitutes the last element of the SCP model, pertains to the quantifiable results or outcomes within a market context. This encompasses various metrics, including profitability, operational efficiency, innovation levels, product quality, and the overall welfare of consumers. According to Narver and Savitt (1971), performance is characterized as the outcome of market conduct, measured through indicators such as net profits, the return on equity for owners, and the efficiency in utilizing resources like machinery and equipment, among other factors. Measurement-wise, performance is determined by contrasting industry-wide firm outcomes regarding price, output, quality, distribution of resources, productivity, etc. (Neuberger, 1997). Typically, this involves using accounting metrics like NIM, RoE, and RoA, among others. The SCP model suggests that market performance is influenced by both market structure and firm conduct (Bain, 1956).

2.3.3 Relative Market Power Hypothesis (RMH)

The underlying principle of the Relative Market Power (RMP) theory revolves around a company's ability to influence the market dynamics for a specific product. This theory posits that it is market share, rather than market concentration achieved through collusion, that is the primary driver of market power. It suggests that firms possessing significant market shares along with unique offerings can leverage their leadership status to elevate prices beyond their marginal costs. Importantly, it is only those companies with substantial market shares that can effectively capitalize on this market power, irrespective of the overall market concentration.

Firms that boast distinctive product lines and larger market shares tend to wield greater influence in the market, allowing them to set prices and achieve profits that exceed the average (Seelanatha, 2010) Consequently, a positive relationship may exist between market share and firm performance, as the relative market power theory asserts that only those firms with considerable market shares and unique products can command higher prices for their offerings.

2.3.4 Efficient Structure Hypothesis (ESH)

Research on the association between concentration and performance, such as that conducted by Peltzamn (1977) and Brozen (1983), challenges the market structural hypothesis. Instead, they

developed the efficiency hypothesis. According to their research, the reason behind the profit differential is not directly related to the hypothesis of collusion or market concentration, but rather to the slight variations in bank efficiencies. The efficiency hypothesis posits that differences in the efficiency levels of institutions result in corresponding differences in their profitability. This indicates that the profitability of banks is affected by the overall efficiency within the industry. Market share and profitability are therefore primarily driven by differences in competitiveness rather than market concentration.

The higher financial results have been attained by reducing overall operating costs through the effective use of resources, skilled labor, superior management, advanced production, and information technologies. For a company to become more profitable, cost efficiency alone is insufficient. Instead, it must become highly competitive in the marketplace by lowering borrowing rates, raising deposit rates, and increasing market shares. Consequently, efficiency, not a greater degree of concentration (collusion), is what leads to profits and market share.

Numerous studies, including those by Berger and Hannan (1993), Maudos (1998), Mendes and Rebello (2003), Katib (2004), Papadopoulos (2004), Sathya (2005), Fu and Heffernan (2009), Chortareas et al. (2009), and Seelanatha (2010), have redirected their attention to understanding how efficiency impacts the structure-performance relationship by explicitly estimating various efficiency components. The examination of the efficiency spectrum has generally led to two distinct presentations of the efficiency structure (ES) hypothesis test. Firms characterized by technical efficiency (TE) tend to enjoy larger market shares, increased profits, and reduced costs, as they excel in minimizing production costs for a given output. Similarly, firms that demonstrate scale efficiency are noted for operating near the minimum average cost point, reinforcing the relationship established by Berger and Hannan (1993). Most studies investigating the structural-profit relationship rely on the foundational equation proposed in the Berger and Hannan model, which is as follows:

$$P = f\,(TE, SE, CONC, Z) + e$$

P stands for the firm performance measure and **SE** and **TE** stand for scale and technical efficiency, respectively. While, **CONC** stands for concentration in a certain market, and **Z** represents a control variable vector.

Despite the ongoing discussions regarding the SCP hypothesis, empirical studies have explored the ES hypothesis in conjunction with the SCP hypothesis, as noted by Weiss in 1974 and Smirlock in 1985. As a result, the ESH should not be seen as an independent model that entirely dismisses the SCP hypothesis; instead, it can be regarded as a different perspective within the SCP framework. Still, there isn't a satisfactory conclusion to the argument between the efficiency and concentration theories (Goddard et al., 2007).

In summary, the implications and interpretations of the two approaches seem to be fundamentally incompatible. The efficient market hypothesis suggests that a higher concentration within an industry leads to diminished competition, resulting in an inverse

relationship between efficiency and competition. In other words, this perspective alters the direction of causality, shifting it from efficiency influencing competition to the opposite, which stands in stark contrast to the Structure-Conduct-Performance (SCP) paradigm. The SCP, on the other hand, proves that market inefficiency is caused by low levels of competition from highly concentrated industries. The viewpoint appears to be at odds with the efficient theory, which holds that as a market gets more concentrated, it becomes more efficient, and anti-concentration measures are unnecessary economic distortions (Goddard, 2001).

2.3.4.1 Efficiency

Efficiency refers to the capability of an organization to deliver the appropriate goods or services with the desired quality while maintaining cost-effectiveness. It reflects how well a company leverages its resources to generate output that meets quality standards (Farrell, 1957). In an ideal scenario, a company achieves full efficiency by producing an optimal combination and quantity of output that enhances profits while reducing costs. Despite the critical role of efficiency, attaining it can be fraught with challenges stemming from various factors. Production managers may face limitations in planning and foresight, coordination of intricate operations may fall short, and there may be insufficient understanding of current practices and factor pricing. These aspects are vital for realizing productive efficiency.

Economic efficiency, which encompasses productive efficiency, is a broader concept often viewed as business efficiency from the perspective of a firm. It is grounded in two fundamental principles: first, that a firm's resources are finite, and second, that these resources can be allocated in various ways. Firms utilize limited resources such as human capital, machinery, materials, finance, and time for production. Given their scarcity and potential alternative applications, it is logical for a rational firm to aim to maximize the value of these resources and achieve optimal results (Barthwal, 1984).

According to Farrell (1957), the overall economic efficiency of a production unit is comprised of two key elements: technical efficiency and allocative efficiency. This means that economic efficiency is essentially the integration of both these efficiencies, as noted by Coelli et al. (1998). Achieving economic efficiency requires not only the selection of appropriate goods for production but also the effective allocation of resources, the adoption of efficient production methods, and the optimal distribution of the produced goods among consumers. Economists contend that the correct application of economic principles fosters optimal efficiency in resource allocation and utilization, ensuring that output aligns with the diverse needs of society. Drawing on the foundational concepts established by Debreu (1951) and Farrell (1957), which form the basis of productive efficiency (the production frontier), overall economic efficiency can be analyzed through various dimensions.

A. Technical Efficiency

Technical efficiency within a production unit pertains to the ability to maximize output from a specific set of inputs, taking into account the physical relationships involved in production (Farrell, 1957). This concept reflects the capability of a firm or decision-making entity to achieve optimal output levels using the resources at hand. A production unit that operates with technical efficiency can either produce the same level of output with reduced inputs or increase output levels while maintaining the same input usage (Green, 1993). The degree of technical efficiency is determined by comparing actual production levels to the ideal or potential production capacity. To assess a firm's technical efficiency, one must analyze the discrepancies between the actual output and the efficient frontier, which signifies the highest achievable production. A firm is regarded as perfectly efficient when its production point aligns with this frontier; conversely, if it is situated below the frontier, it is classified as technically inefficient.

B. Scale Efficiency

Scale efficiency pertains to the benefits that larger firms experience by spreading fixed costs, like those associated with advertising or technology, across a larger volume of production. This concept assesses whether entities, such as banks, are functioning at the lowest point of their long-run average cost curve. It emphasizes technical efficiency, which reflects a bank's capability to optimize output from a specific set of inputs over a defined timeframe (Adongo et al., 2005). Typically, scale economies are evaluated using data from the entire population of banks within a sample, rather than a limited subset. Theoretically, this concept is relevant only to the production possibilities frontier, where firms achieve full efficiency and cost minimization at every level of output (Berger and Humphrey, 1994).

C. Cost Efficiency

Cost efficiency evaluates the extent to which a bank's expenses correspond with those of an exemplary institution that generates an equivalent set of outputs under comparable circumstances, including environmental factors, regulations, and operational guidelines. This concept is based on a cost function, which indicates that variable costs are influenced by input prices, output levels, fixed inputs or outputs, environmental conditions, and stochastic variations. The formulation of such a cost function can be expressed as follows;

$$C= f(x, y) + \mu_c + v_c \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

In this context, C represents the variable costs, while x denotes the vector of prices for variable inputs, and y indicates the vector of quantities for variable outputs. The inefficiency factor, denoted as μc, reflects the potential for costs to exceed optimal levels due to inefficiencies,

which can include both allocative and technical inefficiencies. Additionally, vc signifies the random error that encompasses both measurement inaccuracies and chance events, which can lead to fluctuations in costs for banks, resulting in either higher or lower expenses than expected.

The cost efficiency of bank 'B' is defined as the estimated expenses required to generate bank B's output vector, assuming the bank operated with the same level of efficiency as the most effective institution in the sample, while accounting for identical external variables (x, y). This figure is then divided by the actual costs incurred by bank B, with adjustments made for random errors;

$$costEffB = \frac{C^{min}}{C^{B}} = \frac{exp\,[f(x^{B},\mathrm{Y^{B}},Z^{\mathrm{B}},\mathrm{V^{B}}]}{exp\,[f(x^{B},Y^{B},Z^{B},V^{B}]}\ \frac{exp\,[{\mu_c}^{min}]}{exp\,[{\mu_c}^{B}]} = \frac{{\mu_c}^{min}}{{\mu_c}^{B}} \ldots\ldots\ldots (2)$$

The term ${\mu_c}^{min}$ refers to the lowest value of ${\mu_c}^{B}$ Among all banks included in the sample. The cost-efficiency ratio can be interpreted as the fraction of costs or resources that are utilized effectively. This efficiency metric varies between 0 and 1, with a value of one indicating the optimal performance of a firm within the analyzed dataset.

2.3.4.2 Efficiency Measures/Approaches

According to Leon (2014), methods for assessing efficiency can be divided into two main categories: parametric and non-parametric approaches. Among the non-parametric techniques, Data Envelopment Analysis (DEA) is the most widely utilized. DEA stands out from basic efficiency ratios by accommodating multiple inputs and outputs, thereby providing deeper insights into potential efficiency enhancements and their extent. Notably, DEA does this without needing to know the relative values of inputs and outputs, which is a requirement for traditional ratio analysis (Cooper, Seiford, & Tone, 2000).

DEA offers several significant benefits. It does not constrain the functional form and permits the incorporation of various variables and values, including ratios. Additionally, variables can be assessed in different units, and it is straightforward to identify deviations from the efficiency frontier (Thanassoulis, 2001). On the other hand, while the stochastic frontier model seeks to address some limitations of DEA, it remains a topic of ongoing discussion among scholars. Non-parametric analyses tend to impose less structure on the efficiency frontier but fail to account for random errors arising from chance, data inaccuracies, or measurement mistakes. These random variations can obscure true efficiency levels, complicating the differentiation between actual efficiency deviations and those caused by external factors. As a result, there is no agreement on the most effective efficiency-measuring frontier (Berger & Humphrey, 1997; Goddard et al., 2001).

2.3.4.3 Input Output specification

Input-output specifications in Data Envelopment Analysis (DEA) models can be categorized as either input-oriented or output-oriented. The selection of orientation is contingent upon the objective, which may involve minimizing inputs while achieving a specific level of outputs or

maximizing outputs based on a defined set of inputs. The existing theoretical literature does not conclusively determine which orientation is more advantageous (Goddard et al., 2001). Nevertheless, both input-oriented and output-oriented models will delineate the same efficiency frontier, thereby identifying the same group of efficient banks. The complexity arises from the abstract nature of bank outputs and the ongoing debate within banking literature regarding the measurement of outputs in a multi-input-multi-output framework. To tackle this challenge, two main methodologies are employed: the production approach and the asset/intermediation approach.

2.3.4.4 Product Approach

For account holders, banks are primarily seen as service providers. They are regarded as businesses that use both labor and capital to create different kinds of loan and deposit accounts. Banks handle customer transactions and document processing, handling payment instruments, credit reports, and loan applications. This approach defines total costs as the operating expenses associated with the production of each product type, while outputs are assessed based on the volume of deposit and loan accounts or transactions related to each product. Consequently, banks are viewed as offering two distinct categories of services: those for financial depositors and those for financial users (Sealey & Lindley, 1977).

2.3.4.5 Intermediation Approach

Banks are primarily regarded as intermediaries that facilitate the flow of funds between savers and investors, rather than merely as providers of loan and deposit services. Given that direct service flows are often not accessible, it is typically assumed that these flows correlate with the financial value held in accounts, such as the total amount of loans and deposits (Berger & Humphrey, 1991). Within this context, the input of funds and their related interest expenses should be incorporated into the analysis, as funds serve as the essential "raw material" in the financial intermediation process. Banks engage in intermediation by collecting deposits and other liabilities, subsequently transforming these resources into interest-generating assets (Sealey & Lindley, 1977, as cited in Issyk & Hassan, 2002). Consequently, deposits are viewed as an additional input alongside capital and labor, leading to the inclusion of both operating and interest costs in the overall production process.

2.4 Empirical Literature Review

Numerous studies have been carried out based on the two prevailing paradigms, yielding varied outcomes that both support and challenge the traditional structure-conduct-performance (SCP) and efficiency theory. This body of empirical research is presented in chronological order and encompasses data from Ethiopia as well as international contexts.

The influence of market structure on the profitability of private commercial banks in Ethiopia was analyzed by Abdulwali, M. (2018). The study involved a review of financial statements from eight private commercial banks over the period from 2008/9 to 2016/17, utilizing panel

data for the analysis. Through the application of Ordinary Least Squares regression, the research established that both market share and concentration significantly affect bank profitability. Conversely, the age of the bank was identified as a variable with a negative and statistically insignificant effect on profitability. Other determinants influencing bank profitability included efficiency, size, risk, and the composition of the loan portfolio.

In a separate study, Demessie Dea and P. Hrushikesava (2016) explored the connections between market concentration, structure, and the performance of Ethiopian commercial banks. This research utilized secondary data from the National Bank of Ethiopia, covering the years from 1990 to 2013, and employed three regression models to evaluate the Structure-Conduct-Performance (SCP) and Efficiency-Structure (EFS) hypotheses. The results indicated that enhancements in technical efficiency, increased market share, and larger bank size positively influenced bank performance. Furthermore, the study highlighted the importance of reducing market concentration and fostering competition to improve performance within the oligopolistic landscape of Ethiopian banking. However, it concluded that there was insufficient statistical evidence to assert a strong relationship between concentration and performance, suggesting that concentration's impact on bank performance in Ethiopia is limited.

A study conducted by Sori, T. (2014) investigated the elements that affect the profitability of private commercial banks in Ethiopia. Utilizing a quantitative research methodology, the study employed a statistical cost accounting model to estimate profitability, which was assessed through the return on assets with balance sheet, industry-specific, and macroeconomic variables. The findings indicated that factors such as gross domestic product, current deposits, loans and advances, and other liabilities exhibited a statistically significant positive correlation with the profitability of banks. Conversely, profitability was found to have a negative and statistically significant relationship with market concentration and fixed deposits.

In a separate analysis, Tesfaye, K. (2013) examined the performance determinants of Ethiopian commercial banks by analyzing unbalanced annual audited financial statements from 16 banks over a decade (2003-2012) alongside macroeconomic data. The results revealed that the profitability of these banks is influenced more by factors beyond the loan-to-deposit ratio, which were statistically significant. Notably, the cost-income ratio and liquidity were found to negatively impact bank performance. Additionally, there were strong correlations between profitability and both concentration and the size of the banking system. However, the study did not find any supporting evidence for a relationship between macroeconomic variables and bank performance.

A comprehensive analysis of market structure, profitability determinants, and competitive dynamics within the banking sector of MENA economies was conducted by Hatem Elfeituri in 2016. Covering the period from 1999 to 2012, the research aimed to explore the relationship between bank profitability and market structure, while also assessing whether the efficient

hypothesis (EH) or the structure-conduct-performance (SCP) hypothesis better explains bank performance. The findings indicated a rejection of the EH in favor of the SCP hypothesis, emphasizing that increased market dominance leads to monopoly profits.

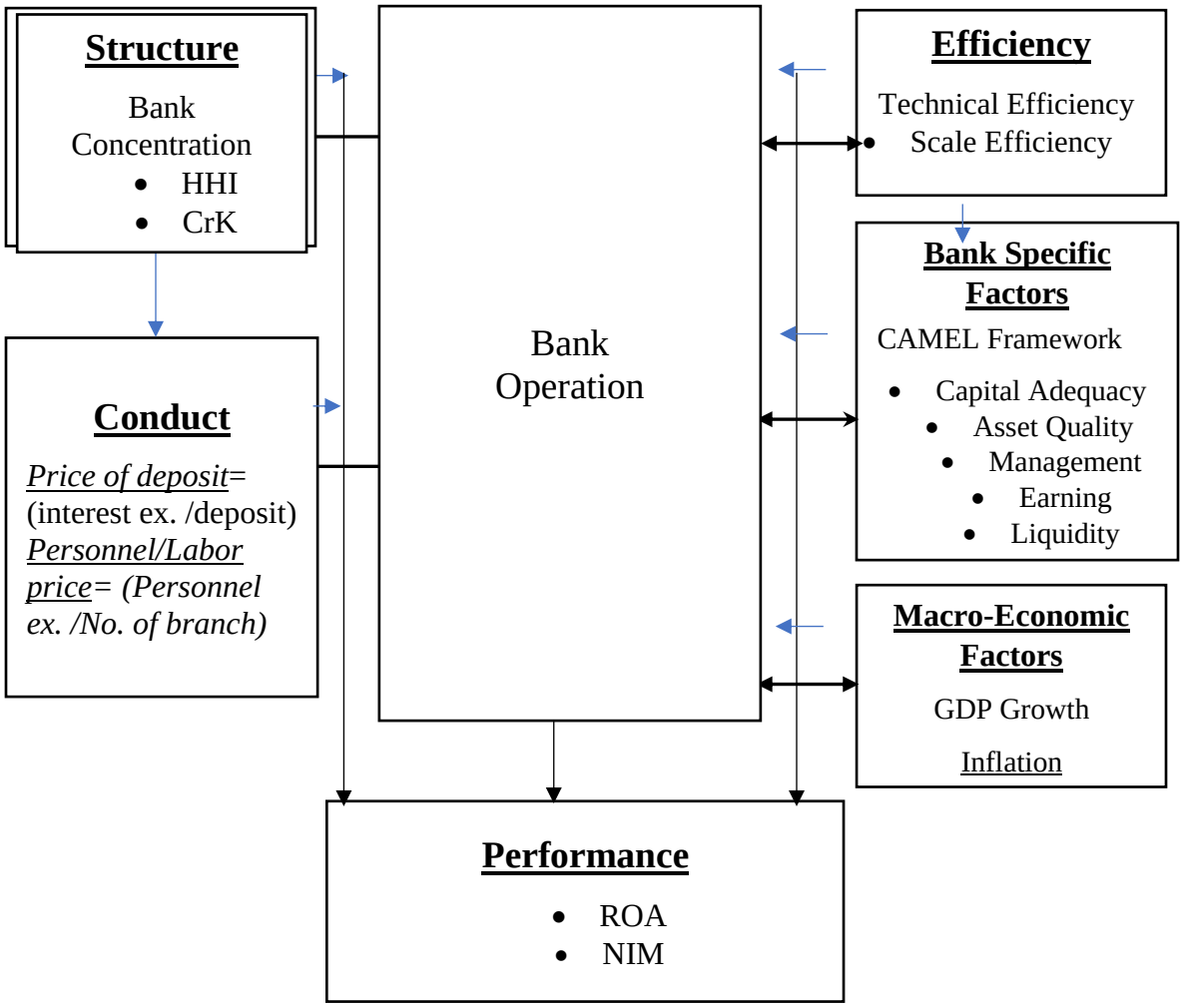
In a separate study, Ali Mirzaei, Guy Liu, and John Beirne examined the impact of market structure on bank profitability across forty developed and emerging economies in 2012. They discovered notable differences in how bank profitability relates to market structure between advanced and emerging banking markets. Specifically, in developed banking sectors, a positive correlation was found between market share and profitability, indicative of competitive dynamics. Conversely, in emerging markets, a negative relationship was observed between the concentration of large banks and profitability, suggesting inefficiencies among these institutions. Additionally, developed markets exhibited a greater capacity for bank financing that translates into sales and profits compared to their emerging counterparts. Ultimately, the researchers concluded that developed banking markets demonstrate a significantly higher level of competitiveness than those in the developing world.

Lalith Seelanatha (2010) investigated the performance, efficiency, and market dynamics of the banking sector in Sri Lanka. The research focused on the relationship between the efficiency and market structure of banks and their overall performance, specifically in terms of profitability and net interest margin, drawing on existing literature related to structure, conduct, and performance. The findings of the study suggest that the Sri Lankan banking sector does not align with the conventional structure-conduct-performance paradigm, indicating that the performance of banks is more significantly influenced by the operational efficiency of the institutions rather than by the concentration of the market or the scale of individual banks.

2.5 Conceptual Framework

After examining prior research on the SCP framework, the factors influencing bank performance, and the principles of efficiency theory, the following conceptual framework has been formulated for this study.

Figure 1: Schematic Diagram showing the relationship between variables based on the SCP Framework



Author's Framework (modified from the Structure-Conduct-Performance Model of Boru, 2018)

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Research Methods and Procedures

3.2.1 Research design

To examine the impact of market structure and efficiency on bank performance, this study adopts a framework similar to the empirical model proposed by Berger and Hannan (1993). They formulated four hypotheses based on the traditional market structure paradigm and the efficient structure paradigm. These hypotheses include the Structure-Conduct-Performance (SCP) hypothesis, the Relative Market Power (RMP) hypothesis, the Technical Efficiency (TE) hypothesis, and the Scale Efficiency (SE) hypothesis.

Structure-Conduct-Performance (SCP): This hypothesis, grounded in the traditional SCP framework, posits that the collusive behavior of dominant firms within an industry affects the price-setting mechanisms in the market, enabling these firms to achieve higher profits compared to their competitors. Consequently, the SCP hypothesis suggests a positive correlation between market concentration and firm performance, utilizing concentration ratios as a proxy for the collusive market power of leading firms.

Relative Market Power (RMP): This hypothesis asserts that firms with larger market shares and differentiated product offerings possess greater market power, which they leverage to influence market prices and secure above-average profits. Thus, a positive relationship is anticipated between market share and firm performance.

The first two hypotheses focus on the effects of market structure variables on firm performance. The first hypothesis investigates how collusive behavior impacts performance, while the second explores how individual firms capitalize on their market power. For either hypothesis to be accepted, the estimated coefficients must be positive and statistically significant.

The subsequent two hypotheses assess the validity of the efficient structure paradigm. The Efficient Structure Hypothesis (ESH) contends that both superior performance and substantial market share stem from the operational efficiency of individual decision-making units within the market. As a result, efficiency variables are included as independent factors in the revenue equations. These hypotheses predict that the influence of market structure on firm performance is negligible and economically inconsequential. Berger and Hannan also proposed two additional hypotheses to investigate the relationship between firm performance and efficiency.

Technical Efficiency (TE): This hypothesis suggests that firms with superior production processes can operate at lower costs, thereby achieving higher profits and market shares. High technical efficiency enables these firms to capture a larger market share at the expense of less efficient competitors, indicating a positive relationship with profitability, technical efficiency, market share, and concentration.

Scale Efficiency (SE): This hypothesis posits that performance disparities among firms arise not from differences in management or production quality, but rather from variations in economies of scale. It predicts that firms operating at optimal scales can produce goods and services at lower costs, leading to higher profits and, consequently, increased market share.

3.2.2 Research Approach

Given that, the research employed a quantitative approach, utilizing statistical data and analytical tools to test the study's hypotheses. As noted by Creswell (2005), a quantitative approach is essential for examining the cause-and-effect relationships between variables through statistical analysis.

3.2.3 Sampling and Study Period

The population for this study consists of all commercial banks registered with the National Bank of Ethiopia, which includes a total of thirty banks within the country's banking sector. The selection of the study sample is based on two primary criteria: the commercial nature of the banks and the availability of data spanning at least ten years. As a result, 13 private banks and 1 government bank were excluded from the analysis. Consequently, the research focuses on 17 commercial banks that are active in Ethiopia's banking industry, as detailed in Table 1 below. The researcher utilized data for a period of 11 years, specifically from 2013 to 2023, allowing for the examination of relationships among the variables through a total of 187 observations, derived from the 17 commercial banks over the 11-year timeframe.

Table 1: *List of all Banks in Ethiopia based on their Establishment date*

#	Bank Name	Year Est. (G.C)
1	Development Bank of Ethiopia	1909
2	Commercial Bank of Ethiopia	1963
3	Awash	1994
4	Dashen	1995
5	Bank of Abyssinia	1996
6	Wegagen	1997
7	Hibret	1998
8	Nib	1999
9	Cooperative Bank of Oromia	2004
10	Lion	2006
11	Oromia	2008
12	Zemen	2008
13	Berhan	2009
14	Bunna	2009
15	Abay	2010

#	Bank Name	Year Est. (G.C)
16	Addis	2011
17	Enat	2011
18	Debub Global	2012
19	Zamzam	2020
20	Hijira	2021
21	Goh Betoch	2021
22	Siinqee	2021
23	Shebele	2021
24	Ahadu	2021
25	Tsedey	2022
26	Amhara	2022
27	Tsehay	2022
28	Gadaa	2022
29	OMO	2022
30	Sidama	2022
31	Rammis	2022

Source: ***(Compiled from the NBE website, 2023)***

3.2.4 Data Sources and Types

This research utilized secondary data sources to examine the impact of industry concentration on the performance of banking firms in Ethiopia. The secondary data were obtained from the National Bank of Ethiopia and the audited annual financial statements of each bank. Data were collected annually for the period from 2013 to 2023, with figures recorded as of June 30th each year. Additionally, findings from previous studies on related topics were incorporated to provide a more comprehensive understanding of the research issues.

The study employed balanced panel data, which integrates both time series and cross-sectional data. One of the key advantages of using panel data is the increased number of observations it provides. In Ethiopia, there are 30 commercial banks, including one state-owned bank, with 13 of these having commenced operations within the last three years (as shown in Table 1). The average operational duration for private banks is approximately 11 years. Even the oldest private bank, which has been in operation for 29 years, presents a sample size that may be inadequate for conducting robust statistical analyses. For example, effective time series analysis typically requires at least 30 years of data.

In this context, panel data allows for the application of statistical techniques that would not be feasible with a smaller dataset. As noted by Baltagi (2001), panel data combines elements of cross-sectional and time series data, resulting in a more extensive dataset. Kennedy (2008)

emphasized that panel data provides richer information compared to using only cross-sectional or time series data, enabling the exploration of additional dimensions. The use of panel data offers more informative insights, greater variability, reduced collinearity among variables, increased degrees of freedom, and enhanced efficiency (Baltagi, 2001, p. 6). This richness and flexibility make panel data particularly advantageous for the objectives of this study.

3.2.5 Model Specification

The basis for analyzing the connection between market concentration and performance, as articulated through the Structure-Conduct-Performance (SCP) and Efficient Market Structure hypotheses, was laid out by Berger and Hannan in 1993. Their methodological approach serves as a foundation for evaluating four key hypotheses: the conventional SCP hypothesis, the Relative Market Power (RMP) hypothesis, the Technical Efficiency hypothesis, and the Scale Efficiency hypothesis. These hypotheses are examined using the empirical model presented below, which aims to assess the market dynamics within the Ethiopian banking sector.

Model I;

$$\mathbf{P_{it} = \alpha_0 + \beta_1 P_{i-1} + \beta_2 CONC + \beta_3 MS + \beta_4 TE + \beta_5 SE + \sum_{i=1}^{k} \lambda i\, Zi + \alpha i + yt + \varepsilon i \quad \ldots\ldots\ldots\ldots\ldots (1)}$$

Where, pi represents performance metrics, specifically profitability or net interest margin, while pi-1 denotes its previous value. The coefficients β1, β2, β3, and β4 correspond to the estimated impacts of market concentration, market share, technical efficiency, and scale efficiency, respectively.

Technical efficiency (TE) refers to a bank's capability to achieve a specific output level with the least cost, whereas scale efficiency (SE) indicates the bank's ability to operate at optimal output levels, benefiting from economies of scale given similar production and management technologies.

The variable Z encompasses control factors such as Capital Adequacy, Asset Quality, Management Efficiency, Liquidity, Ownership, GDP growth, and Inflation, with λ representing the estimated coefficients for these control variables.

Market share for the i^{th} bank is denoted as MS, while market concentration is assessed using the Herfindahl-Hirschman Index (HHI), and ε signifies random error, with i indicating the i^{th} bank. Meanwhile, αi and yt account for unobserved bank-specific and time-specific fixed effects, respectively.

The acceptance of the Structure-Conduct-Performance (SCP) hypothesis occurs when β1 CONC is positive and statistically significant, while β2 MS equals zero. Conversely, the efficient

structure hypothesis is validated if both β1 CONC and β2 MS are zero, with β3 TE and β4 SE being positive and statistically significant.

If the Relative Market Power (RMP) hypothesis holds, β MS will be positive and statistically significant. The interplay between market structure and efficiency suggests that more efficient firms will capture greater market share, thereby contributing to increased market concentration. The Efficiency Structure (EFS) hypothesis is upheld if more efficient firms demonstrate higher profitability and market share, leading to the estimation of parameters for the specified functional forms.

Model II;

$$\mathbf{MS_i = \alpha + \beta_1 TE + \beta_2 SE + \sum_{i=1}^{k} \lambda i\ Zi + \varepsilon i} \quad \ldots\ldots\ldots\ldots\ldots \mathbf{(2)}$$

Model III;

$$\mathbf{CONC_i = \alpha + \beta_1 TE + \beta_2 SE + \sum_{i=1}^{k} \lambda i\ Zi + \varepsilon i} \quad \ldots\ldots\ldots\ldots\ldots \mathbf{(3)}$$

If the aforementioned models demonstrate a statistically significant positive coefficient for efficiency variables, it may be interpreted as an unconditional acceptance of the relationship between market structure and efficiency.

A. Efficiency Measure

Efficiency measures in this study are calculated using a non-parametric approach known as Data Envelopment Analysis (DEA). This methodology, introduced by Charnes, Cooper, and Rhodes in 1978, allows for the assessment of the relative efficiency of various decision-making units (DMUs) by analyzing multiple inputs and outputs. DEA evaluates efficiency concerning the best practices within the banking sector, represented by what is termed the efficient frontier.

One of the key advantages of the DEA methodology is its flexibility; it does not impose restrictions on the functional form and can accommodate various types of variables and values, including ratios. Additionally, it allows for the measurement of these variables in different units, making it easier to identify deviations from the efficiency frontier (Thanassoulis, 2001). However, it is important to note that DEA can be sensitive to outliers and the selection of input and output variables.

This study employs both the Charnes-Cooper-Rhodes (CCR) model and the Banker-Charnes-Cooper (BCC) model to analyze scale effects or scale efficiency. The CCR model operates under the assumption of constant returns to scale (CRS), while the BCC model accounts for variable returns to scale (VRS).

To compute the efficiency scores for banks and the overall industry, the study utilizes the MaxDEA X Version. The resulting DEA efficiency scores, which encompass both technical and

scale efficiency, are subsequently incorporated as regressors in a second-stage model to examine the relationship between efficiency and profitability. Furthermore, these scores are analyzed to determine whether there are significant differences in efficiency between private and state-owned banks.

B. Market Concentration Measures

Literature commonly utilizes two primary metrics to assess market power: the concentration ratio of the top k firms (CRk) and the Herfindahl-Hirschman Index (HHI).

i. Top k-Firms Concentration Ratio (CRk):

The concentration ratio quantifies the market share percentage held by the largest firms (k) within a given industry. This metric reveals the degree to which a market is controlled by a limited number of large entities versus a multitude of smaller ones. Since there is no universally accepted criterion for defining the value of k, the selection of firms for the concentration index is somewhat subjective (Al-Muharram, 2007). A higher concentration ratio indicates a more significant concentration within the banking sector, thereby granting substantial market power to the larger banks operating in that space. The ratio approaches zero when there is an infinite number of firms of equal size, while it equals one when the banks considered in the ratio encompass the entire industry. The concentration ratio can be represented in several different formats.

ii. Herfindahl-Hirschman Index (HHI):

The Herfindahl-Hirschman Index (HHI) was originally introduced in the realms of industrial economics by Herfindahl in 1950 and Hirschman in 1964. It is widely recognized as a key metric for assessing market concentration within theoretical discussions (Bikker & Haaf, 2000). Unlike the Concentration Ratio (CRk), which merely reflects the size of the top k firms, the HHI provides a more comprehensive view by considering both the number of firms in a market and their respective market shares. The calculation involves squaring the market shares of all firms and then aggregating these squared values.:

$$\mathbf{HHI} = \sum_{i=1}^{N} (\mathbf{MSi})^2$$

The market share of firm i is represented by MSi, while N denotes the total number of firms operating within the market.

The Herfindahl-Hirschman Index (HHI) is a metric used to assess market concentration, illustrating how market share is distributed among a limited number of banks concerning total assets, loans, or deposits (Ross, 1990) (Morris, 1984). This index operates on a scale from 0 to 1,

where an HHI of 0 signifies a perfectly competitive market and an HHI of 1 indicates a pure monopoly. The HHI is calculated by summing the squares of the market shares of all banks within the market, with values nearing 0 reflecting a large number of small banks, while values approaching 1 denote the prevalence of a few large banks. A reduction in the HHI typically points to heightened competition and reduced pricing power, whereas an increase suggests a consolidation of market power among fewer institutions.

3.2.6 Method of Data Analysis and Estimation Technique

A range of economic variables interact in complex ways, which can be effectively modeled by incorporating the lagged dependent variable among the regressors. This inclusion captures the temporal persistence of the dependent variable. In dynamic panel models, individual effects are integrated to create a more generalized model, resulting in a two-tier error structure that consists of individual-level errors and overall residual errors. As a result, dynamic panel models often encounter issues of autocorrelation due to the interplay between individual effects, stemming from variations among individuals, and the lagged dependent variable (Baltagi, 2005).

When the dependent variable is influenced by its lag, and this lagged variable is also affected by the error term, the use of pooled Ordinary Least Squares (OLS) estimation becomes problematic in dynamic panel contexts due to endogeneity concerns. Pooled OLS assumes strong homogeneity between the regressors and the error term, which leads to biased and inconsistent estimators (Roodman, 2009). Similarly, while the Fixed Effects (FE) estimator presumes that individual-specific effects are fixed and uncorrelated with the error term, this assumption is often violated in dynamic regressions, particularly in panels characterized by a large cross-sectional dimension (N) and a small-time dimension (T), resulting in bias and inconsistency (Nickell, 1981).

In contrast, the Random Effects (RE) estimator assumes that individual-specific heterogeneity is uncorrelated with the regressors. However, the presence of a lagged dependent variable can introduce endogeneity issues until the time horizon approaches infinity, making the application of RE in dynamic panel models challenging. Although asymptotic estimators for FE and RE may reduce bias with longer periods, such approaches are impractical for short panels, as is the case in this study (Roodman, 2009). The Generalized Least Squares (GLS) estimator, which is designed to address heteroskedasticity, also struggles with endogeneity.

Traditional estimation methods for panel data models such as pooled OLS, fixed effects, within estimators, random effects, and GLS are generally inadequate for dynamic panel data due to their inability to effectively manage endogeneity and individual-specific effects (Baltagi & Baltagi,

2008). Utilizing these methods in a dynamic panel model, particularly when including a lagged dependent variable, can lead to biased and inconsistent parameter estimates.

To address these challenges, Arellano and Bond (1991) introduced the Generalized Method of Moments (GMM), a dynamic panel estimator specifically designed to handle endogeneity in models that incorporate lagged dependent variables. GMM addresses endogeneity by employing lagged values of the explanatory variables as instruments, which are orthogonal to the error term while being strongly correlated with the endogenous regressors. This method is effective in mitigating omitted variable bias, unobserved panel heterogeneity, measurement errors, and autocorrelation. GMM is particularly well-suited for panel data with a large number of individuals (N) and a relatively short time frame (T), and it accommodates unobserved individual fixed effects (Mileva, 2007).

Moreover, GMM is beneficial as it accounts for causal relationships between the dependent and independent variables, thereby reducing endogeneity. It also addresses potential correlations between explanatory variables and individual-specific fixed effects embedded in the error term, as well as autocorrelation arising from the lagged dependent variable. Given these advantages, the system GMM approach is frequently recommended for dynamic panel estimation (Roodman, 2009).

Finally, the study utilized STATA software Version 15 to conduct both descriptive and inferential analyses. The descriptive analysis included calculations of the mean, standard deviations, maximum, and minimum values. A panel regression model was employed to investigate the relationship between market structure and the performance of banking firms in Ethiopia while controlling for various macroeconomic variables and bank-specific factors. Key regression assumptions, including multicollinearity, heteroskedasticity, and autocorrelation, were assessed to ensure the model's validity.

3.2.5 Definition and Measures of Variables

The regression models utilized in this study incorporate several key variables, including return on assets (ROA), market concentration (measured by the Herfindahl-Hirschman Index, HHI), relative market share, technical efficiency, and scale efficiency. Market concentration and relative market share serve as proxies for market power, allowing for an examination of how market structure affects bank performance. Technical efficiency and scale efficiency scores, derived from Data Envelopment Analysis (DEA), represent the efficiency of the banks. Additional control variables include risk (assessed through the ratio of loans to total assets), size (logarithm of total assets), economic growth (GDP growth), and inflation. A dummy variable is also included to capture the effects of government ownership on bank performance.

Previous research has employed various performance measures in studies of market structure and firm performance. Gilbert (1984) noted that both profitability and price indicators have been used to represent bank performance. Consistent with earlier studies (Goldberg & Rai, 1996; Smirlock, 1985), this research utilizes both profitability metrics and net interest margin (NIM) as proxies for bank performance.

Commonly, studies have used the ratio of profits to assets (ROA) (Goldberg & Rai, 1996; Yu & Neus, 2005) and the ratio of profits to equity (ROE) (Smirlock, 1985; Yu & Neus, 2005) to assess bank performance. ROA reflects a bank's ability to generate profits from its assets, although it may be influenced by off-balance-sheet activities. Conversely, ROE indicates the return to shareholders on their equity and is calculated as ROA multiplied by the total assets-to-equity ratio, often referred to as the equity multiplier, which measures financial leverage. Generally, banks with lower leverage (higher equity) report higher ROA but lower ROE. Since ROE analysis does not account for the increased risks associated with high leverage, and given that financial leverage is often subject to regulation, ROA is considered a crucial metric for evaluating bank profitability (Sundararajan et al., 2002). Therefore, this study employs ROA as a primary measure of bank performance.

Additionally, NIM is used as an alternative performance measure that is directly linked to market conditions. NIM is calculated by dividing net interest income by total assets, serving as a direct indicator of performance influenced by both the market power of leading firms and the efficiency of management decisions.

Efficiency reflects how effectively banks utilize inputs to generate outputs. Prior research has identified five approaches for specifying inputs and outputs: intermediation, production, user-cost, value-added, and assets (Avkiran, 2000). However, there is no consensus on the most suitable approach for defining banks' inputs and outputs. This study adopts the intermediation approach (Boru, 2018), identifying two inputs (total deposits and branch size) and two outputs (loans and advances, and other earning assets), along with their corresponding prices.

Given that banks operate as multi-product firms, identifying a single variable to represent the banking market is challenging. Variables such as total deposits (Goldberg & Rai, 1996; Smirlock, 1985), total loans, and total assets can serve as proxies for market capacity. This study selects total assets as the preferred proxy for market size in the banking sector, as it encompasses the outcomes of all banking activities.

Previous studies have frequently utilized the Herfindahl-Hirschman Index (HHI) (Bikker & Haaf, 2002; Choi & Weiss, 2005; Goldberg & Rai, 1996; Molyneux, 1999; Yu & Neus, 2005) and the concentration ratio of the top 'k' banks (CRk) to measure collusive power within a market. The CRk ratio considers the total market shares of the k largest banks. Contemporary research tends to favor HHI as a measure of market concentration because it accounts for the market shares of all firms, whereas CRk focuses solely on the largest banks. Consequently, this study employs HHI as a proxy for collusive power in the banking sector.

In addition to the specified variables, this study incorporates the CAMEL framework, which is commonly used by bank regulators to assess performance. The CAMEL approach is a composite measure that evaluates financial institutions based on five critical dimensions: Capital adequacy, Asset quality, Management, Earnings, and Liquidity. Furthermore, macroeconomic factors such as inflation and GDP growth rate, which significantly influence profit-making opportunities for banks, are included to account for the broader economic environment. The ownership structure may also impact decision-making in state-owned banks (Goldberg & Rai, 1996; Molyneux, 1999), while privately owned banks typically enjoy greater flexibility in operational policy. As a result, private ownership is expected to have a positive effect on profitability.

***Table 2*:** Research variables and indicators

Variables	Indicator	Symbol	Descriptions	Expected Sign
Performance	Return on Asset	**ROA**	Net income before tax/ Total Asset	
Price	Net Interest Margin	**NIM**	Net Interest Income to Total Asset	
Structure	Concentration ratio on Bank Asset	**HHI**	Measured by HHI	
	Market Share of Deposit	**MS**	The ratio of total bank deposit of each with the total of all deposit banks in the sample	
Efficiency	Technical Efficiency	**TE**	CCR Technical efficiency (intermediation approach)	
	Scale Efficiency	**SE**	BCC DEA estimated score	
Bank Specific CAMEL Framework	**C**apital Adequacy	CA	Total Equity/ Total Asset	-ve/ +ve
	Asset Quality	AQ	The ratio of non-performing loans to total loan	-ve
	Management Efficiency	**ME**	Measured in terms of DEA result (Cost Efficiency)	**+ve**
	Liquidity	**LIQ**	Total Deposit/ Total Asset	**-ve**
	Ownership	**OWN**	Dummy variable (1 =privately owned and otherwise 0=government owned bank)	**-ve/ +ve**
Macroeconomics factors	Real GDP growth rate	**GDP**	GDP growth rate (%)	**+ve**
	Inflation rate	**INF**	Annual Inflation rate (%)	**-ve**

Source: ***Author's computation, 2023***

CHAPTER FOUR: RESULT AND DISCUSSION

This part of the research focuses on a quantitative examination of a panel data set derived from the banking sector, structured around three primary steps. Initially, it investigates the connections between industry concentration and efficiency indicators in relation to performance metrics, calculating efficiency scores for both individual banks and the industry as a whole through Data Envelopment Analysis (DEA) while evaluating efficiency differences across various bank categories. Next, it delves into the relationships between specific bank characteristics and performance indicators within the CAMEL framework. Finally, it assesses the interplay between external macroeconomic factors and bank performance. The study subsequently synthesizes the elements of industry concentration, bank-specific characteristics, and external influences into a unified model.

4.1Descriptive Statistics

4.1.1 Measuring Market Concentration and Share

The Herfindahl-Hirschman Index (HHI) and the concentration ratio (CR) are the primary metrics utilized to assess market concentration, as noted by Scherer and Ross (1990), Morris (1984), and Agu (1992). Among these, the k-bank concentration ratio (CRk) is particularly favored in empirical research due to its straightforward nature and low data requirements. The CRk value spans from 0 to 1, with values nearer to 0 reflecting low concentration levels, while those approaching 1 indicate a high degree of concentration.

Table 3: *Market Concentration Ratio for Bank Total Asset*

Measurement	Bank Group	Year											Average
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Total Asset	State	70	70	66	66	65	61	60	59	55	53	50	61
	Private	30	30	34	34	35	39	40	41	45	47	50	39
	Small*[1]	9	10	11	11	13	14	14	15	15	14	16	13

Source: Autor's Computation, 2024

Table 3 measures market concentration focusing on total assets for different groups of banks (state, private, and small) over 11 years (2013-2023), the value of the giant state Bank is on average more than 61% for the last 11 years period, while the top 3 and 5 Banks including the gov't Bank shared more than 72 and 80. The overall concentration ratios have shown a downward trend across all measurements (CR1, CR3, and CR5) from 2013 to 2023, which indicates a more competitive banking environment over time. Case in point, in 2013, state banks held 70% of total assets, which steadily declined to 50% by 2023. The data indicates a steady decrease in the market share of the state-owned bank, which has experienced a drop of 20

[1] *'Small Banks' indicates banks except for the top 6 private banks (Awash, Dashen, Abyssinia, Wegagen, Hibret & Nib)*

percentage points over 11 years. This could imply increase competition from private and small banks, inefficiencies, or strategic shifts within the banking sector favoring private sector growth.

On the other hand, Private banks started with 30% of the total assets in 2013, and this increased to 50% by 2023, experiencing steady growth, matching state banks' share by 2023. The 20-percentage point increase reflects a more competitive and possibly more innovative sector, suggesting that private banks are expanding rapidly, perhaps due to increased competition, innovation, or customer preference shifting towards these banks.

On the other hand, while their share has grown, small banks still occupy a relatively small portion of the total assets compared to state and private banks. Their 7-percentage point increase, though modest, signals their growing relevance in the financial system. The gradual increase in small banks' market share indicates growth, albeit at a slower pace compared to private banks, but still represents a significant shift.

The Herfindahl-Hirschman Index (HHI)

The Herfindahl-Hirschman Index (HHI) is determined by taking the square of each firm's market share within a specific banking sector and then aggregating these squared figures. The HHI can vary from zero, which signifies a market with an unlimited number of competitors, to 10,000, indicating that a single entity possesses the entirety of the market share. This index serves as an indicator of market concentration, highlighting the extent to which a limited number of banks control total assets. The HHI is constrained between 0 and 1, where a value of 1 denotes a monopoly and a value of 0 represents ideal competition. An HHI that approaches 0 implies a market populated by numerous small banks, whereas a value near 1 suggests a landscape dominated by a few large institutions. Typically, HHI values below 0.1000 are interpreted as indicative of a non-concentrated market, values ranging from 0.1000 to 0.1800 reflect moderate concentration, and values exceeding 0.1800 are associated with high concentration.

Table 4: HHI for Banks Total Asset

Measurement	Description	Year										
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
HHI	**Asset**	0.50	0.50	0.44	0.45	0.43	0.39	0.38	0.36	0.32	0.30	0.27

Source: Author's Computation, 2024

Table 4 illustrates that during the initial years of 2013-2014, the Herfindahl-Hirschman Index (HHI) registered at 0.50, signifying a banking market characterized by high concentration, with a limited number of large banks holding a substantial share of the overall assets. Over time, the HHI gradually declined, dropping to 0.43 by 2017. This decline suggests a reduction in market concentration, likely due to increased competition, the entry of new banks, or a redistribution of assets among smaller banks. The downward trend continued, with the HHI reaching 0.36 by 2020, signaling a more competitive environment as smaller banks gained market share,

diminishing the dominance of the largest institutions. By 2023, the HHI had further decreased to 0.27. While this reflects a notable reduction in market concentration, the sector remains relatively concentrated, albeit with gradual shifts toward a more competitive structure.

Market Share

Table 5: *Market Share for Bank Deposit*

	Market Share for Bank Deposit (in %)										
Bank	**2013**	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
CBE	**67**	**68**	**67**	**67**	**65**	**63**	**61**	**57**	**54**	**52**	**51**
Awash	**5**	**5**	**5**	**5**	**5**	**6**	**7**	**7**	**8**	**9**	**9**
Dashen	**7**	**6**	**6**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**6**
BoA	**4**	**3**	**3**	**3**	**4**	**4**	**4**	**5**	**7**	**7**	**8**
Wegagen	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**2**	**2**	**2**
Hibret	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Nib	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CBO	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**4**	**5**	**6**	**6**
Lion	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**3**	**2**	**2**	**1**
OIB	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**
Zemen	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**
Bunna	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**
Birhan	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**
Abay	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**
Addis	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Global	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**
Enat	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: Author's Computation, 2024

Table 5 highlights that in all the observed years, the government-owned CBE consistently held the largest market share in terms of bank deposits, commanding more than half of the total market share across the banking industry. Among privately owned banks, Awash, Bank of Abyssinia, Dashen, and Cooperative Bank of Oromia hold the most significant shares, with market distributions of 9%, 8%, 6%, and 6%, respectively. This concentration indicates that while CBE dominates the deposit market, a select group of private banks also maintain a notable presence, reflecting a competitive dynamic within the private banking sector where these institutions are key players in attracting deposits. Despite CBE's overwhelming control, these private banks continue to carve out significant portions of the market.

4.1.2 Measuring Efficiency of Banks

Table 5 below exhibits the descriptive statistics for the **Technical Efficiency (TE)** and **Scale Efficiency (SE)** scores of state and private banks in the Ethiopian banking industry. The giant state bank has an average technical efficiency score of **0.96**, indicating it is operating at 96% efficiency on average compared to the best-performing banks. The small standard deviation (0.04) suggests that there is very little variation in the technical efficiency scores across the period, meaning it performs fairly consistently. The minimum TE score is 0.90, with some periods reaching the maximum efficiency score of **1.00**, which indicates full efficiency. On the other hand, it has a very high average scale efficiency score of **0.99**, showing that it is almost operating at the most efficient scale. The standard deviation is even smaller (0.01), indicating nearly all periods are similarly scale efficient. The range between the minimum (0.98) and the maximum (1.00) scores shows very little discrepancy, and some periods achieve full-scale efficiency.

On the other hand, Private banks have a lower average technical efficiency score of **0.88** compared to state bank. This suggests that, on average, private banks are operating at 88% efficiency, which is below the performance of state bank. The higher standard deviation (0.08) reflects a wider variation in technical efficiency among private banks. The minimum TE score is 0.63, indicating that some private banks are significantly less efficient than others, while others achieve full efficiency (1.00). Conversely, the average scale efficiency for private banks is **0.98**, which is quite high, though slightly lower than state banks. The standard deviation (0.02) is slightly higher than that of state banks but still shows little variation in scale efficiency. The minimum score (0.89) indicates that a few private banks are operating below optimal scale efficiency, but many are performing at full-scale efficiency (1.00).

*Table 6***:** Descriptive Statistics of Estimated Efficiency Scores (2013-2023)

Bank Group	Efficiency Score	Obs.	Mean	Std. Dev.	Min	Max
State Bank	Technical Efficiency	11	0.96	0.04	0.90	1.00
	Scale Efficiency	11	0.99	0.01	0.98	1.00
Private Bank	Technical Efficiency	176	0.88	0.08	0.63	1.00

	Scale Efficiency	176	0.98	0.02	0.89	1.00

4.1.3 Descriptive Statistics of Test Data

The summaries of the descriptive statistics and Pearson correlation coefficients for the test data are illustrated in Tables 7 and 8 below. The standard deviation values reveal a modest level of statistical dispersion, indicating that the data points utilized in the equation estimations are tightly grouped around their average. Such low standard deviations suggest minimal variability within the data, potentially increasing the reliability of the estimation process. This uniformity in data distribution contributes to a more transparent understanding of the relationships among variables, as evidenced by the Pearson correlation coefficients, and indicates a stable underlying dataset.

Table 7: Descriptive Statistics of Test Data

Variable	Definition	Mean	Std. Dev.	Min	Max
Profitability	Return on Asset (ROA)	0.039	0.013	0.005	0.074
Net Interest Margin (NIM)	Interest Inc.- Interest ex to average earning asset	0.044	0.013	0.010	0.080
Concentration ratio	HHI of total Asset	0.023	0.091	0.000	0.494
Market Share	Market share of Bank deposits	0.058	0.138	0.000	0.666
Technical Efficiency (TE)	CCR DEA estimated scores	0.887	0.077	0.630	1.000
Scale efficiency (SE)	BCC DEA estimated scores	0.979	0.021	0.890	1.000
Capital Adequacy (CA)	Total Capital to Total Asset of Banks	0.152	0.079	0.042	0.951
Asset Quality (AQ)	Provision for NPLs to Total Asset	0.010	0.010	0.000	0.078
Management Efficiency (ME)	DEA estimated score-Cost efficiency	0.771	0.113	0.020	1.000
Liquidity (LIQ)	Loans & advance to Total Asset	0.768	0.087	0.426	1.399
Real GDP growth	National Account	7.066	1.980	4.317	9.582
Inflation	Annual Inflation rate	16.479	9.313	6.628	33.890
Ownership	Dummy Variable (State Bank=0 and Privet Bank=1				

Source: Autor's Computation (Stata Version 15)

The computed correlation coefficients suggest that there is minimal correlation between the variables incorporated in the model. Overall, the correlations between the independent variables are relatively low, with values below 0.50, suggesting that multicollinearity is not a significant concern. According to Gujarati and Porter (2009), multicollinearity becomes a serious issue when the pairwise correlation coefficient between two independent variables exceeds 0.8.

Therefore, based on these results, it is evident that the model does not suffer from any serious multicollinearity problems.

Table 8: Pearson correlation coefficient

	Correlation Matrix of Bank-Specific Variables						
Variables	ROA	NIM	HHI	TE	CA	AQ	ME
ROA	1						
NIM	1	1					
HHI	0.1432	0.1432	1				
TE	0.0133	0.0133	0.1999	1			
CA	0.2189	0.2189	0.1452	0.0049	1		
AQ	0.4015	0.4015	0.017	0.1101	0.0042	1	
ME	0.5513	0.5513	0.3425	0.3649	0.3852	0.1277	1
LIQ	0.3948	0.3948	0.0107	0.394	0.2058	0.079	0.1054

Source: Autor's Computation (Stata 15)

4.2 Econometric results and discussions

This section focuses on the presentation and discussion of the econometrics model results considering the **SCP** paradigm, the **ESH**, and the **RMP** hypothesis. The SCP paradigm suggests that a concentrated market structure (few large firms) allows for collusive behavior or market power, which then leads to higher profits (performance). In banking, SCP would predict that higher concentration leads to greater profitability and interest margins because banks with significant market power can charge higher rates for loans and offer lower rates for deposits. On the other hand, the ESH hypothesis argues that better performance (higher profitability and margins) is due to greater efficiency rather than market power. More efficient firms (banks) achieve higher profits because they operate at lower costs, enabling them to gain market share without resorting to market manipulation or collusion. Whereas, the RMP Hypothesis advocates that banks with larger market shares or unique services can set prices above competitive levels within a certain range of regulatory limits, resulting in higher profits. It differs from SCP because it focuses on the market power of individual firms rather than overall market concentration. Accordingly, the interpretation of the regression result considering those alternative theories and factors affecting bank performance both internal and external factors examined here under:

4.2.1 Model Diagnostics and Robustness Test

4.2.1.1 Multicollinearity Test

The assessment of multicollinearity was conducted using the Variance Inflation Factor (VIF) test, which is determined by the formula 1 divided by tolerance. Tolerance itself is calculated as 1 minus R^2, where R^2 represents the coefficient of determination. The findings from the VIF analysis reveal that all explanatory variables exhibit a VIF value below 10. Consequently, even if multicollinearity were to be considered significant, its impact is not substantial enough to warrant concern and can be overlooked.

Table 9: Multicollinearity Test

Variable	*VIF*	*1/VIF*
INF	6.83	0.146478
GDP	5.77	0.173388
ME	2.81	0.355622
TE	2.35	0.425679
MS	1.79	0.558419
CA	1.69	0.590899
LIQ	1.65	0.607821
SE	1.19	0.840902
AQ	1.06	0.94758
Mean VIF	2.79	

Source: Autor's Computation (Stata 15)

Besides, there are few methods to evaluate the robustness of system generalized method of moments (GMM) estimation in the presence of autocorrelation. One such method is the Arellano-Bond test, which assesses the presence of positive autocorrelation against the null hypothesis of no autocorrelation. If the p-value from the Arellano-Bond test is below 0.05, we can reject the null hypothesis, indicating significant evidence of positive autocorrelation.

Moreover, the Sargan Test of Over-identifying Restrictions plays a crucial role in verifying the validity of instruments in a regression model, especially within the context of GMM estimation. This test examines whether the instruments are exogenous, meaning they do not correlate with the error term. A high p-value suggests that the instruments are valid, as it does not reject the null hypothesis of their uncorrelated nature with the error term. In contrast, a low p-value raises concerns about the validity of some instruments, pointing to potential endogeneity or over-identification issues.

4.2.1.2 Arellano-Bond Test for Autocorrelation:

The P-values obtained from the Arellano-Bond tests for first-order (AR (1)) and second-order (AR (2)) autocorrelation are 0.287 and 0.285, respectively. Since the null hypothesis, which posits the absence of autocorrelation, cannot be rejected at the 5% significance level, this indicates that there is no evidence of either first-order or second-order autocorrelation present in the differenced residuals.

4.2.1.3 Sargan Test of Over-identifying Restrictions:

The p-values for each of the models exceed 0.05, suggesting that the instruments employed are valid and do not exhibit a correlation with the error term. Additionally, the Wald chi-squared test results for the overall model are significant, demonstrating a good fit between the model and the data. The extremely significant p-values (0.000) further confirm that the overall models are statistically significant, indicating that the independent variables collectively account for the variations in the dependent variables.

4.2.2 Interpretations of Regression Result and Integrating the Findings with Theories:

4.2.2.1 Interpretations of the regression result in light of the Theories:

A. Concentration Ratio (Bank Asset):

SCP: The **positive and statistically significant correlation** between the concentration ratio and both ROA and NIM aligns with the SCP hypothesis. A higher concentration ratio means a few large banks dominate the market, and these banks can engage in anti-competitive behavior (e.g., price-setting), leading to higher profitability and interest margins. This suggests that in the Ethiopian banking market, banks in more concentrated sectors earn greater profits, supporting the SCP argument.

RMP: While SCP focuses on the entire market's structure, RMP suggests that banks with dominant market power should perform better. The positive correlation with profitability and interest margin also fits within the RMP framework, as these larger banks likely hold more influence over market prices and, hence, enjoy better performance.

B. Market Share (Bank Deposit):

SCP and RMP: Interestingly, the **negative and statistically significant relationship** between market share and both ROA and NIM contradicts the predictions of both SCP and RMP. According to RMP, banks with greater market share should perform better, as they can set prices and benefit from economies of scale. However, the negative correlation suggests that as banks grow larger in terms of deposit share, their profitability and interest margins decrease. This could indicate diseconomies of scale, where larger banks become less efficient as they expand, or increased competitive pressure as they try to retain their market position. This result challenges both the SCP and RMP hypotheses in the Ethiopian banking sector, indicating that gaining a large deposit market share may not always lead to superior financial performance.

C. Technical Efficiency:

ESH: The **negative and statistically significant correlation** between technical efficiency and NIM contradicts the ESH. According to ESH, more efficient banks should be able to achieve higher profitability due to their cost advantages. However, the negative sign implies that technically efficient banks are charging smaller interest margins, which could suggest that these

banks are passing on their cost advantages to customers in the form of lower rates, potentially improving their competitiveness but reducing their margins.

SCP/RMP: The SCP hypothesis doesn't directly address technical efficiency. However, in highly concentrated markets, efficiency might matter less than market power. The **statistically insignificant relationship** between technical efficiency and ROA also contradicts the ESH, as it suggests that technical efficiency does not significantly affect profitability in this banking market. Instead, market concentration and power seem to play a larger role.

D. Scale Efficiency:

ESH: The **positive but statistically insignificant relationship** between scale efficiency and ROA/NIM challenges the ESH. According to ESH, banks that achieve greater scale efficiency should perform better, but this result implies that scale efficiency is not a major determinant of profitability or interest margins. This suggests that other factors, such as market structure or conduct, may be more important in determining performance in this market.

The **negative and statistically significant relationship** between scale efficiency and both the concentration ratio and market share might indicate that larger banks (with more market power or concentration) face decreasing returns to scale, becoming less efficient as they grow.

Table 10: Estimated regression coefficient

Independent Variables	**Dependent Variables**			
	Profitability (ROA)	Net Interest Margin	Concentration	Market Power
Log of Return on Asset (t-1)	0.461*			
Log of Net Interest Margin (t-1)		0.582**		
Concentration	1.528***	1.466***		
Market Share	-1.775***	-1.709***		
Technical Efficiency	-2.018	-2.856*	15.718*	6.092**
Scale Efficiency	2.573	2.139	-21.353*	-10.392**
Capital Adequacy	1.317	1.274	-2.348*	-1.231**
Asset Quality	-0.071	-0.096	0.112	0.095
Management Efficiency	2.191**	2.360**	-6.489*	2.426
Liquidity	0.671	0.220	8.974**	4.953**
Ownership	5.261	4.814	2.805	0.990*
Real GDP Growth rate	-0.236***	-0.188**	-0.261	-0.110
Annual Inflation rate	-0.247***	-0.189***	-0.685**	-0.316**
Cons	2.101	2.117	6.915	3.253
Observations	*166*	*166*	*180*	*180*
Number of instruments	56	56	67	67
Number of Banks	17	17	17	17
Tests	P-Value	P-Value	P-Value	P-Value
Arellano-Bond test for AR (2)	0.285	0.49	0.50	0.27

Sargan test of overid. restrictions:	0.903	0.926	0.43	0.487
Wald chi2(12) =149.83, 157.43, 645.28, 10635.56	0.000	0.000	0.000	0.000

*Note: *, **, and *** indicate null hypothesis rejection at 10%, 5% &1% significance level, respectively.*

Source: Author's Computation (Stata 15)

4.2.2.2 Integrating the Findings with Theories:

Support for SCP Hypothesis: The **positive correlation** between concentration and both ROA and NIM provides evidence supporting the SCP theory. Banks operating in more concentrated markets tend to have higher profitability and wider interest margins, which suggests that market structure plays a significant role in determining bank performance. The banking sector in Ethiopia may be benefiting from limited competition, enabling larger banks to enjoy higher profits.

Mixed Evidence for RMP Hypothesis: The **negative correlation** between market share and both profitability and margins goes against the RMP hypothesis, which would predict that individual banks with more market share should have greater pricing power and better financial performance. This might indicate that larger banks in terms of deposits are not necessarily able to convert their size into superior performance, possibly due to inefficiencies or competitive pressures.

Rejection of ESH: The **negative relationship** between technical efficiency and interest margins challenges the ESH. While efficient banks might reduce costs, this does not necessarily lead to higher profitability, as they seem to be reducing interest margins, perhaps to remain competitive. The lack of a significant relationship between scale efficiency and performance also suggests that efficiency is not a major driver of performance in this market, further refuting the ESH.

4.2.3 Interpretation and discussion of the significant coefficients

Table 9 shows, the estimated regression coefficients for the dependent variables: Return on Assets (ROA), and Net Interest Margin (NIM), based on a panel data model using a System Generalized Method of Moments (GMM) approach. Below is a detailed interpretation of each independent variable's effect on the dependent variables, focusing on their significance and economic interpretation.

Concentration (HHI) and Profitability (ROA) and Net Interest Margin (NIM): - The results indicate a significant positive relationship between market concentration (HHI) and profitability in the Ethiopian banking industry, specifically for ROA and NIM, both at a 1% significance level (p-value = 0.000 for ROA and p-value = 0.001 for NIM), supporting the research hypothesis. The coefficient of 1.528 for ROA suggests that a 1% increase in market concentration leads to a 1.528% increase in ROA. Similarly, the coefficient of 1.466 for NIM implies that a 1% rise in market concentration results in a 1.466% increase in NIM. This positive and significant correlation suggests a high level of concentration in the banking sector, consistent with previous

studies by Fentaw A., Melaku G. & Yimer K. (2021), Strictures, C. and Wood, G. (2003), and Molyneux P. and Thornton J. (1992). The positive relationship between concentration and profitability may reflect the current structure of the Ethiopian banking sector, suggesting a need for increased competition and the entry of more banks into the market.

Market Share and ROA & NIM: The regression results also showed that the coefficient of market share is positive; the coefficient on MS is statistically significant at 1% level (p-value=0.005) and (p-value=0.007%), respectively for ROA and NIM. The coefficient -1.775 implies that a change in one percent of market share will have an effect to change in ROA by -1.775%. This suggests that as individual banks gain a larger market share of deposits, their overall profitability (ROA) may decrease. Similarly, the coefficient of -1.709 for NIM implies that a one percent change in market share results in a -1.709 percent decrease in NIM. This indicates that as banks grow larger in terms of deposit share, they may face reduced interest margins, possibly due to competitive pressures or diseconomies of scale. Overall, it fails to support market share has a positive effect on profitability because it has a negative effect on both ROA and NIM, which is compatible with the study results of Fentaw A., Melaku G. & Yimer K. (2021) and Maudos, J. (1998).

Technical Efficiency and ROA & NIM: The relationship between technical efficiency and ROA is statistically insignificant, meaning that efficiency doesn't appear to play a major role in profitability, as measured by ROA. However, technical efficiency has a negative and statistically significant at least at a 10% level (p=0.071) relationship with NIM. This implies that technically efficient banks tend to have lower interest margins, possibly because their efficiency allows them to operate with smaller margins. This suggests that banks in this market may rely more on their market position and concentration rather than efficiency to drive performance.

Capital Adequacy and ROA & NIM: The results indicate a significant positive relationship between Capital Adequacy (AQ) and profitability in the Ethiopian banking industry, specifically for ROA and NIM, both at a 1% significance level (p-value = 0.000 for ROA and p-value = 0.001 for NIM). The coefficient 1.317 revealed that a change in one percent of capital adequacy will have an effect of a change in ROA of 1.317 percent, while the coefficient 1.274 revealed that a percentage change in capital adequacy will have an effect of 1.274 percent change in NIM, which is also consistent with the findings of Fentaw A., Melaku G. & Yimer K. (2021) and Kosmedou, K (2008) who pointed out that those well-capitalized banks face lower risks of going bankrupt, building their credit worthiness, and reducing their cost of funding which will ultimately enhance their profit margin.

Management Efficiency: Management efficiency has a positive and significant impact on both profitability (ROA) and net interest margins (NIM), with a 5% significance level (p-value = 0.026 for ROA and p-value = 0.035 for NIM). This indicates that banks with more effective management practices tend to achieve higher returns and better interest margins, likely due to better decision-making and resource allocation. It highlights the importance of not only diversifying revenue streams but also focusing on managing expenses efficiently. This finding

underscores the importance for bank management to carefully consider costs when making decisions regarding branch expansions, IT investments, e-banking channels, staffing, and other cost-intensive initiatives.

The regression model has integrated GDP growth and the inflation rate to account for the effects of the macroeconomic environment. The findings reveal that profitability exhibits a statistically significant negative correlation with both GDP growth and the inflation rate, with a significance level of 1%. However, the coefficients of both GDP & inflation rate are not significantly different higher as other bank-specific variables, -0.188 and -0.189, respectively. The increasing at decreasing rate of GDP growth rate could be the principal cause for the observed negative relationship. Since the growth rate of Ethiopian GDP steadily dropped from 9.9% during 2013 to 6.3% in 2023, (NBE Report, June 2023). Thereby, the slowing pace of GDP growth could be attributed to the following reasons:

- **Diminishing Marginal Gains**: When GDP growth starts to increase at a decreasing rate, the initial benefits that banking firms gain from economic expansion start to taper off. Early in the growth cycle, demand for loans may be high, and banks can benefit from increased borrowing activity. However, as GDP growth slows down, businesses may have already met their expansion goals, leading to a decline in borrowing and thus reducing the growth of banks' profitability.
- **Credit Saturation**: During periods of rapid growth, businesses, and individuals may already have accessed significant levels of credit. As growth begins to decelerate, the market may become saturated, reducing new lending opportunities for banks. This saturation can limit further improvements in profitability (ROA), even though the economy is still growing.
- **Increased Non-Performing Loans (NPLs)**: As economic growth decelerates, the quality of loans may decline, leading to a rise in NPLs, which negatively affects bank profitability.
- **Shift in Loan Demand**: As economic growth slows; the nature of credit demand may change. Businesses may reduce investment activities, and individuals may become cautious about taking on new loans. This shift can result in a reduction in high-yield loan portfolios for banks, further affecting profitability.

The negative impact of inflation on profitability and margins suggests that higher inflation rates reduce banks' ability to generate profits. This could be due to increased costs or pressure on interest margins in an inflationary environment. The control variable used to incorporate asset quality & liquidity was not able to provide evidence for significant association with either variable.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

This study examines the impact of market concentration on bank performance in Ethiopia, applying the Structure-Conduct-Performance (SCP) framework and efficiency hypotheses. The findings confirm a positive relationship between market concentration and profitability (ROA) and net interest margin (NIM), supporting the SCP hypothesis. However, the negative effect of market share on performance challenges the Market Power Hypothesis, indicating that larger banks do not always gain higher profits.

Efficiency measures yield mixed results. Technical efficiency negatively affects NIM, suggesting that efficient banks charge lower interest margins, while scale efficiency has no significant impact on profitability, implying that larger size does not guarantee higher returns.

Among bank-specific factors, management efficiency and capital adequacy significantly enhance performance, while asset quality and liquidity show no notable effects. Macroeconomic conditions also play a role, as GDP growth negatively affects performance, likely due to the slowing growth rate, while inflation erodes profitability.

Overall, these findings highlight the need for enhanced competition, stronger management practices, and economic stability to improve bank performance in Ethiopia.

5.2 Implications

The findings offer key insights for policymakers and bank managers in Ethiopia. The positive link between market concentration and profitability supports the SCP hypothesis, suggesting that a concentrated market structure enables banks to exert some market power. However, the negative impact of individual market share on performance highlights the need for increased competition. Policymakers should promote regulatory reforms to encourage new market entrants, enhance competition, and improve consumer welfare.

For bank managers, the study emphasizes the importance of management efficiency in boosting profitability and optimizing interest margins. Strengthening capital adequacy is also crucial for risk management and long-term financial stability. Banks should reinforce capital buffers to withstand economic fluctuations and market uncertainties.

The findings suggest that technical efficiency alone does not guarantee higher profitability, implying that banks should focus on pricing strategies and revenue diversification. Additionally, the impact of macroeconomic factors, such as inflation and GDP growth, underscores the need for adaptive strategies to navigate economic fluctuations and sustain performance.

5.3 Recommendations

Encouraging Competition: Policymakers should create an enabling environment for the entry of new players into the Ethiopian banking sector. This could include relaxing barriers to entry, offering incentives for foreign banks, or promoting the growth of small and medium-sized banks. Increased competition is crucial to mitigating the effects of market concentration and encouraging efficiency in the sector.

Strengthening Capital Adequacy: Given the positive relationship between capital adequacy and performance, banks should focus on maintaining strong capital reserves. Policymakers could provide guidelines that encourage banks to bolster their capital through retained earnings or equity offerings, which would strengthen their ability to weather financial shocks and support sustainable growth.

Adapting to Macroeconomic Conditions: Banks should closely monitor macroeconomic indicators such as inflation and GDP growth to adapt their strategies accordingly. During periods of high inflation, banks may need to revise their pricing and risk management strategies to protect their margins. Similarly, in times of economic growth, banks should be cautious about overexpansion and ensure that they maintain profitability by focusing on core business areas.

By addressing these key areas, both the regulatory framework and bank operations can be improved, leading to a more competitive, efficient, and stable banking sector that is better positioned to support economic growth and financial inclusion in Ethiopia.

Recommendation for future researchers: Future researchers could include newly founded banks in their studies to measure market entry impacts, examine the influence of digital banking on competitiveness, and add qualitative insights from industry professionals to provide deeper perspectives. Furthermore, a comparative research of other African banking markets would improve contextual understanding.

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APPENDIXES

Appendix I: Panel data

Bank-ID	Year	ROA	NIM	TE	SE	CA	AQ	LIQ	OWN	GDP	INF
0	**2013**	0.03	0.04	0.42	0.76	0.47	0.003	0.79	0	9.58	7.46
0	**2014**	0.03	0.04	0.43	0.70	0.05	0.002	0.79	0	9.26	6.89
0	**2015**	0.04	0.04	0.46	0.72	0.04	0.010	0.79	0	9.39	9.57
0	**2016**	0.04	0.04	0.47	0.76	0.04	0.010	0.75	0	8.43	6.63
0	**2017**	0.03	0.03	0.45	0.74	0.08	0.012	0.74	0	8.56	10.69
0	**2018**	0.03	0.04	0.50	0.67	0.08	0.015	0.80	0	5.82	13.83
0	**2019**	0.03	0.04	0.53	0.63	0.07	0.012	0.76	0	7.36	15.81
0	**2020**	0.02	0.04	0.57	0.61	0.06	0.012	0.73	0	5.06	20.36
0	**2021**	0.02	0.03	0.56	0.60	0.05	0.011	0.74	0	4.64	26.84
0	**2022**	0.02	0.04	0.62	0.62	0.06	0.012	0.77	0	4.32	33.89
0	**2023**	0.02	0.03	0.53	0.53	0.06	0.012	0.81	0	5.30	29.30
1	**2013**	0.05	0.06	0.53	1.00	0.23	0.006	1.37	1	9.58	7.46
1	**2014**	0.06	0.07	0.60	1.00	0.24	0.003	1.40	1	9.26	6.89
1	**2015**	0.03	0.03	0.58	1.00	0.13	0.009	0.73	1	9.39	9.57
1	**2016**	0.02	0.04	0.58	1.00	0.15	0.005	0.75	1	8.43	6.63
1	**2017**	0.02	0.05	0.58	0.96	0.14	0.006	0.77	1	8.56	10.69
1	**2018**	0.03	0.05	0.62	0.93	0.12	0.005	0.77	1	5.82	13.83
1	**2019**	0.03	0.05	0.63	0.85	0.13	0.005	0.75	1	7.36	15.81
1	**2020**	0.03	0.06	0.70	0.83	0.13	0.011	0.79	1	5.06	20.36
1	**2021**	0.03	0.05	0.64	0.79	0.12	0.012	0.79	1	4.64	26.84
1	**2022**	0.03	0.05	0.66	0.70	0.11	0.013	0.81	1	4.32	33.89
1	**2023**	0.03	0.07	0.76	0.76	0.12	0.012	0.81	1	5.30	29.30
2	**2013**	0.09	0.08	0.42	1.00	0.31	0.078	2.42	1	9.58	7.46
2	**2014**	0.10	0.08	0.48	0.99	0.35	0.077	2.41	1	9.26	6.89
2	**2015**	0.03	0.03	0.59	0.99	0.12	0.008	0.80	1	9.39	9.57
2	**2016**	0.03	0.03	0.56	0.99	0.12	0.008	0.80	1	8.43	6.63
2	**2017**	0.02	0.04	0.58	1.00	0.15	0.009	0.77	1	8.56	10.69
2	**2018**	0.02	0.04	0.58	0.94	0.13	0.005	0.79	1	5.82	13.83
2	**2019**	0.02	0.04	0.60	0.92	0.12	0.004	0.78	1	7.36	15.81
2	**2020**	0.02	0.05	0.68	0.90	0.12	0.001	0.78	1	5.06	20.36
2	**2021**	0.02	0.05	0.67	0.83	0.11	0.004	0.79	1	4.64	26.84
2	**2022**	0.02	0.06	0.68	0.80	0.12	0.005	0.78	1	4.32	33.89
2	**2023**	0.02	0.06	0.74	0.77	0.13	0.007	0.79	1	5.30	29.30
3	**2013**	0.03	0.03	0.48	1.00	0.11	0.000	0.84	1	9.58	7.46
3	**2014**	0.02	0.04	0.52	1.00	0.14	0.000	0.81	1	9.26	6.89
3	**2015**	0.02	0.04	0.51	1.00	0.13	0.007	0.81	1	9.39	9.57
3	**2015**	0.02	0.04	0.56	1.00	0.15	0.002	0.79	1	8.43	6.63
3	**2017**	0.02	0.04	0.54	1.00	0.13	0.004	0.80	1	8.56	10.69
3	**2018**	0.02	0.05	0.66	0.99	0.13	0.007	0.80	1	5.82	13.83
3	**2019**	0.02	0.05	0.68	0.98	0.13	0.008	0.81	1	7.36	15.81
3	**2020**	0.02	0.05	0.64	0.96	0.10	0.008	0.84	1	5.06	20.36
3	**2021**	0.01	0.05	0.56	0.81	0.08	0.011	0.85	1	4.64	26.84
3	**2022**	0.02	0.07	0.74	0.81	0.10	0.012	0.82	1	4.32	33.89
3	**2023**	0.02	0.08	0.83	0.83	0.10	0.014	0.84	1	5.30	29.30
4	**2013**	0.03	0.04	0.60	1.00	0.18	0.002	0.73	1	9.58	7.46

Bank-ID	Year	ROA	NIM	TE	SE	CA	AQ	LIQ	OWN	GDP	INF
4	**2014**	0.03	0.04	0.59	1.00	0.19	0.001	0.73	1	9.26	6.89
4	**2015**	0.03	0.04	0.63	1.00	0.18	0.007	0.72	1	9.39	9.57
4	**2016**	0.02	0.04	0.65	1.00	0.17	0.010	0.69	1	8.43	6.63
4	**2017**	0.02	0.04	0.71	1.00	0.15	0.010	0.67	1	8.56	10.69
4	**2018**	0.03	0.05	0.72	1.00	0.14	0.010	0.73	1	5.82	13.83
4	**2019**	0.02	0.05	0.67	0.99	0.12	0.012	0.79	1	7.36	15.81
4	**2020**	0.02	0.05	0.68	0.94	0.13	0.012	0.79	1	5.06	20.36
4	**2021**	0.00	0.06	0.78	0.94	0.13	0.032	0.79	1	4.64	26.84
4	**2022**	0.01	0.05	0.75	0.95	0.13	0.032	0.79	1	4.32	33.89
4	**2023**	0.02	0.06	0.79	0.89	0.13	0.030	0.80	1	5.30	29.30
5	**2013**	0.03	0.04	0.55	1.00	0.12	0.010	0.77	1	9.58	7.46
5	**2014**	0.02	0.04	0.52	1.00	0.13	0.007	0.79	1	9.26	6.89
5	**2015**	0.02	0.04	0.56	1.00	0.12	0.006	0.78	1	9.39	9.57
5	**2016**	0.02	0.04	0.60	1.00	0.12	0.005	0.76	1	8.43	6.63
5	**2017**	0.02	0.04	0.58	1.00	0.11	0.004	0.75	1	8.56	10.69
5	**2018**	0.02	0.04	0.72	1.00	0.11	0.007	0.70	1	5.82	13.83
5	**2019**	0.02	0.05	0.68	0.98	0.11	0.003	0.80	1	7.36	15.81
5	**2020**	0.02	0.06	0.76	0.97	0.12	0.004	0.81	1	5.06	20.36
5	**2021**	0.02	0.05	0.72	0.96	0.12	0.006	0.81	1	4.64	26.84
5	**2022**	0.02	0.06	0.79	0.91	0.11	0.013	0.79	1	4.32	33.89
5	**2023**	0.03	0.07	0.84	0.87	0.11	0.012	0.78	1	5.30	29.30
6	**2013**	0.03	0.04	0.60	1.00	0.18	0.001	0.73	1	9.58	7.46
6	**2014**	0.03	0.04	0.61	1.00	0.18	0.001	0.74	1	9.26	6.89
6	**2015**	0.03	0.04	0.58	1.00	0.16	0.008	0.74	1	9.39	9.57
6	**2016**	0.02	0.05	0.57	0.99	0.16	0.009	0.78	1	8.43	6.63
6	**2017**	0.02	0.05	0.57	1.00	0.14	0.008	0.78	1	8.56	10.69
6	**2018**	0.02	0.05	0.60	1.00	0.13	0.008	0.81	1	5.82	13.83
6	**2019**	0.02	0.05	0.65	0.99	0.13	0.006	0.82	1	7.36	15.81
6	**2020**	0.02	0.05	0.73	0.97	0.14	0.005	0.79	1	5.06	20.36
6	**2021**	0.02	0.06	0.75	0.96	0.13	0.005	0.80	1	4.64	26.84
6	**2022**	0.02	0.06	0.77	0.94	0.13	0.007	0.81	1	4.32	33.89
6	**2023**	0.02	0.06	0.84	0.90	0.13	0.007	0.77	1	5.30	29.30
7	**2013**	0.03	0.03	0.55	0.94	0.11	0.003	0.68	1	9.58	7.46
7	**2014**	0.05	0.04	0.74	0.97	0.15	0.004	0.74	1	9.26	6.89
7	**2015**	0.03	0.05	0.78	1.00	0.12	0.015	0.64	1	9.39	9.57
7	**2016**	0.00	0.06	0.61	0.98	0.11	0.030	0.79	1	8.43	6.63
7	**2017**	0.02	0.05	0.57	1.00	0.08	0.024	0.78	1	8.56	10.69
7	**2018**	0.02	0.04	0.51	1.00	0.08	0.012	0.80	1	5.82	13.83
7	**2019**	0.02	0.04	0.55	0.99	0.08	0.018	0.75	1	7.36	15.81
7	**2020**	0.02	0.05	0.59	0.91	0.10	0.016	0.87	1	5.06	20.36
7	**2021**	0.02	0.04	0.53	0.85	0.09	0.011	0.87	1	4.64	26.84
7	**2022**	0.02	0.05	0.58	0.76	0.10	0.010	0.84	1	4.32	33.89
7	**2023**	0.02	0.06	0.72	0.72	0.11	0.013	0.83	1	5.30	29.30
8	**2013**	0.04	0.04	0.65	0.99	0.18	0.001	0.72	1	9.58	7.46
8	**2014**	0.03	0.04	0.59	0.99	0.17	0.001	0.74	1	9.26	6.89
8	**2015**	0.03	0.04	0.68	0.98	0.14	0.008	0.76	1	9.39	9.57
8	**2016**	0.03	0.04	0.65	1.00	0.13	0.010	0.78	1	8.43	6.63
8	**2017**	0.02	0.05	0.56	0.99	0.13	0.013	0.80	1	8.56	10.69

Bank-ID	Year	ROA	NIM	TE	SE	CA	AQ	LIQ	OWN	GDP	INF
8	**2018**	0.03	0.05	0.63	0.99	0.13	0.013	0.81	1	5.82	13.83
8	**2019**	0.03	0.05	0.66	1.00	0.13	0.011	0.81	1	7.36	15.81
8	**2020**	0.02	0.05	0.64	0.99	0.11	0.015	0.82	1	5.06	20.36
8	**2021**	0.01	0.07	0.89	0.98	0.11	0.034	0.81	1	4.64	26.84
8	**2022**	0.01	0.06	0.91	0.97	0.12	0.049	0.79	1	4.32	33.89
8	**2023**	0.01	0.06	0.95	0.97	0.12	0.044	0.77	1	5.30	29.30
9	**2013**	0.04	0.02	0.83	0.92	0.15	0.003	0.77	1	9.58	7.46
9	**2014**	0.02	0.02	0.70	0.96	0.17	0.003	0.77	1	9.26	6.89
9	**2015**	0.02	0.04	0.49	1.00	0.10	0.006	0.84	1	9.39	9.57
9	**2016**	0.02	0.05	0.65	1.00	0.12	0.008	0.73	1	8.43	6.63
9	**2017**	0.02	0.04	0.60	1.00	0.10	0.008	0.70	1	8.56	10.69
9	**2018**	0.03	0.05	0.68	1.00	0.11	0.004	0.71	1	5.82	13.83
9	**2019**	0.02	0.05	0.67	1.00	0.12	0.008	0.69	1	7.36	15.81
9	**2020**	0.03	0.05	0.67	0.97	0.14	0.021	0.82	1	5.06	20.36
9	**2021**	0.02	0.05	0.61	0.94	0.13	0.007	0.82	1	4.64	26.84
9	**2022**	0.02	0.05	0.63	0.91	0.13	0.005	0.84	1	4.32	33.89
9	**2023**	0.02	0.06	0.72	0.84	0.13	0.006	0.83	1	5.30	29.30
10	**2013**	0.02	0.03	0.50	1.00	0.14	0.030	0.78	1	9.58	7.46
10	**2014**	0.02	0.04	0.50	1.00	0.12	0.021	0.81	1	9.26	6.89
10	**2015**	0.03	0.03	0.61	0.99	0.16	0.026	0.78	1	9.39	9.57
10	**2016**	0.03	0.02	0.59	0.99	0.14	0.020	0.74	1	8.43	6.63
10	**2017**	0.03	0.02	0.56	0.96	0.14	0.020	0.82	1	8.56	10.69
10	**2018**	0.02	0.02	0.52	0.99	0.14	0.018	0.82	1	5.82	13.83
10	**2019**	0.03	0.03	0.63	0.99	0.16	0.012	0.79	1	7.36	15.81
10	**2020**	0.04	0.05	0.70	1.00	0.17	0.009	0.78	1	5.06	20.36
10	**2021**	0.04	0.04	0.70	0.99	0.18	0.009	0.76	1	4.64	26.84
10	**2022**	0.04	0.04	0.71	0.99	0.18	0.008	0.77	1	4.32	33.89
10	**2023**	0.04	0.06	0.68	0.91	0.18	0.009	0.78	1	5.30	29.30
11	**2013**	0.03	0.04	0.56	0.93	0.18	0.000	0.73	1	9.58	7.46
11	**2014**	0.03	0.04	0.62	0.98	0.17	0.000	0.71	1	9.26	6.89
11	**2015**	0.03	0.05	0.64	1.00	0.15	0.006	0.78	1	9.39	9.57
11	**2016**	0.03	0.05	0.63	1.00	0.14	0.009	0.79	1	8.43	6.63
11	**2017**	0.02	0.04	0.58	1.00	0.14	0.009	0.76	1	8.56	10.69
11	**2018**	0.02	0.05	0.71	1.00	0.15	0.008	0.70	1	5.82	13.83
11	**2019**	0.03	0.06	0.80	1.00	0.19	0.009	0.73	1	7.36	15.81
11	**2020**	0.02	0.06	0.75	1.00	0.16	0.011	0.74	1	5.06	20.36
11	**2021**	0.03	0.07	0.79	0.99	0.15	0.014	0.79	1	4.64	26.84
11	**2022**	0.03	0.07	0.81	0.97	0.15	0.013	0.83	1	4.32	33.89
11	**2023**	0.02	0.08	0.96	0.96	0.14	0.013	0.79	1	5.30	29.30
12	**2013**	0.02	0.02	0.50	0.97	0.17	0.004	0.73	1	9.58	7.46
12	**2014**	0.03	0.04	0.67	1.00	0.21	0.002	0.73	1	9.26	6.89
12	**2015**	0.03	0.03	0.79	1.00	0.17	0.006	0.51	1	9.39	9.57
12	**2016**	0.04	0.05	0.68	1.00	0.15	0.008	0.74	1	8.43	6.63
12	**2017**	0.03	0.04	0.71	1.00	0.18	0.007	0.72	1	8.56	10.69
12	**2018**	0.02	0.05	0.67	1.00	0.18	0.007	0.77	1	5.82	13.83
12	**2019**	0.02	0.05	0.68	1.00	0.15	0.006	0.78	1	7.36	15.81
12	**2020**	0.03	0.06	0.81	1.00	0.16	0.009	0.78	1	5.06	20.36
12	**2021**	0.01	0.06	0.99	0.99	0.14	0.019	0.81	1	4.64	26.84

Bank-ID	Year	ROA	NIM	TE	SE	CA	AQ	LIQ	OWN	GDP	INF
12	**2022**	0.01	0.06	0.76	0.94	0.14	0.026	0.79	1	4.32	33.89
12	**2023**	0.01	0.06	0.81	0.97	0.11	0.024	0.75	1	5.30	29.30
13	**2013**	0.02	0.03	0.52	0.95	0.17	0.003	0.76	1	9.58	7.46
13	**2014**	0.02	0.03	0.53	1.00	0.14	0.002	0.79	1	9.26	6.89
13	**2015**	0.03	0.04	0.63	1.00	0.16	0.006	0.79	1	9.39	9.57
13	**2016**	0.02	0.04	0.61	1.00	0.16	0.007	0.78	1	8.43	6.63
13	**2017**	0.02	0.04	0.59	1.00	0.15	0.007	0.79	1	8.56	10.69
13	**2018**	0.03	0.04	0.65	1.00	0.15	0.008	0.77	1	5.82	13.83
13	**2019**	0.03	0.04	0.74	0.99	0.17	0.008	0.77	1	7.36	15.81
13	**2020**	0.02	0.05	0.60	1.00	0.15	0.007	0.80	1	5.06	20.36
13	**2021**	0.03	0.06	0.65	0.98	0.14	0.010	0.80	1	4.64	26.84
13	**2022**	0.02	0.06	0.68	0.98	0.14	0.010	0.80	1	4.32	33.89
13	**2023**	0.03	0.07	0.83	0.90	0.14	0.010	0.76	1	5.30	29.30
14	**2013**	0.03	0.02	0.75	0.87	0.25	0.004	0.62	1	9.58	7.46
14	**2014**	0.04	0.03	0.86	0.96	0.25	0.004	0.63	1	9.26	6.89
14	**2015**	0.03	0.03	0.85	1.00	0.26	0.005	0.65	1	9.39	9.57
14	**2016**	0.03	0.04	0.86	1.00	0.26	0.005	0.63	1	8.43	6.63
14	**2017**	0.03	0.03	0.76	1.00	0.22	0.004	0.67	1	8.56	10.69
14	**2018**	0.03	0.04	0.77	1.00	0.23	0.004	0.71	1	5.82	13.83
14	**2019**	0.03	0.04	0.83	1.00	0.17	0.005	0.71	1	7.36	15.81
14	**2020**	0.03	0.04	0.83	1.00	0.21	0.005	0.71	1	5.06	20.36
14	**2021**	0.03	0.03	0.85	0.99	0.18	0.005	0.71	1	4.64	26.84
14	**2022**	0.03	0.04	0.90	0.99	0.20	0.009	0.72	1	4.32	33.89
14	**2023**	0.02	0.05	0.87	1.00	0.20	0.009	0.72	1	5.30	29.30
15	**2013**	(0.04)	0.02	0.24	0.24	0.30	0.022	0.43	1	9.58	7.46
15	**2014**	0.02	0.03	0.69	0.82	0.21	0.000	0.57	1	9.26	6.89
15	**2015**	0.02	0.02	0.63	0.91	0.19	0.003	0.72	1	9.39	9.57
15	**2016**	0.04	0.05	1.00	1.00	0.25	0.007	0.67	1	8.43	6.63
15	**2017**	0.02	0.03	0.77	0.98	0.21	0.008	0.69	1	8.56	10.69
15	**2018**	0.03	0.04	0.85	1.00	0.23	0.008	0.66	1	5.82	13.83
15	**2019**	0.04	0.03	0.90	0.96	0.19	0.016	0.63	1	7.36	15.81
15	**2020**	0.03	0.04	0.96	0.96	0.18	0.006	0.68	1	5.06	20.36
15	**2021**	0.02	0.05	0.92	1.00	0.15	0.007	0.75	1	4.64	26.84
15	**2022**	0.02	0.06	0.98	1.00	0.16	0.009	0.78	1	4.32	33.89
15	**2023**	0.03	0.06	1.00	1.00	0.16	0.006	0.76	1	5.30	29.30
16	**2013**	(0.03)	0.00	0.40	0.87	0.95	0.000	0.62	1	9.58	7.46
16	**2014**	0.02	0.02	0.59	0.94	0.20	0.000	0.77	1	9.26	6.89
16	**2015**	0.02	0.03	0.61	0.99	0.20	0.005	0.71	1	9.39	9.57
16	**2016**	0.02	0.03	0.63	1.00	0.21	0.006	0.74	1	8.43	6.63
16	**2017**	0.02	0.02	0.70	1.00	0.19	0.007	0.76	1	8.56	10.69
16	**2018**	0.03	0.03	0.71	1.00	0.18	0.003	0.77	1	5.82	13.83
16	**2019**	0.02	0.03	0.78	0.99	0.17	0.004	0.75	1	7.36	15.81
16	**2020**	0.02	0.04	0.72	0.99	0.16	0.003	0.75	1	5.06	20.36
16	**2021**	0.02	0.03	0.80	1.00	0.14	0.008	0.77	1	4.64	26.84
16	**2022**	0.02	0.03	0.87	1.00	0.15	0.008	0.76	1	4.32	33.89
16	**2023**	0.02	0.04	0.83	1.00	0.16	0.012	0.78	1	5.30	29.30

Appendix II: Regression result of model I (ROA as dependent variable)

```
Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: BankID                          Number of obs      =       166
Time variable : Year                            Number of groups   =        17
Number of instruments = 56                      Obs per group: min =         9
Wald chi2(12) =    149.83                                      avg =      9.76
Prob > chi2   =     0.000                                      max =        10
------------------------------------------------------------------------------
             |              Corrected
      log_ROA|      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ROasset_lag1|   .4612106   .2635292     1.75   0.080    -.0552972    .9777183
     log_HHI|   1.527956    .385373     3.96   0.000     .7726387    2.283273
      log_MS|   -1.77523   .6542854    -2.71   0.007    -3.057606   -.4928541
      log_TE|  -2.017786   1.295884    -1.56   0.119    -4.557671    .5220994
      log_SE|   2.573378   2.828157     0.91   0.363    -2.969708    8.116464
      log_CA|   1.317034   .3614823     3.64   0.000     .6085419    2.025526
      log_AQ|  -.0714826   .1525405    -0.47   0.639    -.3704565    .2274912
      log_ME|   2.190726   .9839436     2.23   0.026     .2622323     4.11922
     log_LIQ|   .6714378   1.188668     0.56   0.572    -1.658309    3.001185
     log_GDP|  -.2360481   .0717264    -3.29   0.001    -.3766292    -.095467
     log_INF|  -.2470529   .0817572    -3.02   0.003     -.407294   -.0868118
         OWN|   5.261238   3.634294     1.45   0.148    -1.861848    12.38432
       _cons|    2.10129   2.142097     0.98   0.327    -2.097143    6.299724
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.log_HHI
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/10).ROasset_lag1
Instruments for levels equation
  Standard
    log_HHI
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.ROasset_lag1
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.06  Pr > z =  0.287
Arellano-Bond test for AR(2) in first differences: z =  -1.07  Pr > z =  0.285
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(43)   =  31.50  Prob > chi2 =  0.903
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(43)   =   2.39  Prob > chi2 =  1.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(34)   =   2.39  Prob > chi2 =  1.000
    Difference (null H = exogenous): chi2(9)    =   0.00  Prob > chi2 =  1.000
```

Appendix III: Regression result of model I (NIM as dependent variable)

```
Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: BankID                          Number of obs      =       166
Time variable : Year                            Number of groups   =        17
Number of instruments = 56                      Obs per group: min =         9
Wald chi2(12) =    157.43                                      avg =      9.76
Prob > chi2   =     0.000                                      max =        10
------------------------------------------------------------------------------
             |              Corrected
      log_NIM |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
NImarigin_lag1 |   .5823609   .2393198     2.43   0.015     .1133027    1.051419
       log_HHI |   1.466212   .4577073     3.20   0.001     .5691226    2.363302
        log_MS |   -1.70996   .6100912    -2.80   0.005    -2.905716   -.5142029
        log_TE |  -2.856542   1.583176    -1.80   0.071     -5.95951    .2464262
        log_SE |   2.139393   3.011048     0.71   0.477    -3.762153     8.04094
        log_CA |   1.274242   .3725865     3.42   0.001      .543986    2.004498
        log_AQ |  -.0967863   .1504729    -0.64   0.520    -.3917077    .1981352
        log_ME |   2.360674   1.118274     2.11   0.035     .1688974    4.552451
       log_LIQ |   .2203636   1.399484     0.16   0.875    -2.522575    2.963302
       log_GDP |  -.1889909   .0769451    -2.46   0.014    -.3398005   -.0381813
       log_INF |  -.1895261   .0629951    -3.01   0.003    -.3129943   -.0660579
           OWN |   4.814232   3.672004     1.31   0.190    -2.382764    12.01123
         _cons |   2.117238   1.925436     1.10   0.272    -1.656548    5.891024
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.log_HHI
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/10).NImarigin_lag1
Instruments for levels equation
  Standard
    log_HHI
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.NImarigin_lag1
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.34  Pr > z =  0.182
Arellano-Bond test for AR(2) in first differences: z =  -0.68  Pr > z =  0.495
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(43)   =  30.39  Prob > chi2 =  0.926
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(43)   =   3.19  Prob > chi2 =  1.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(34)   =   3.19  Prob > chi2 =  1.000
    Difference (null H = exogenous): chi2(9)    =  -0.00  Prob > chi2 =  1.000
  iv(log_HHI)
    Hansen test excluding group:     chi2(42)   =   0.87  Prob > chi2 =  1.000
    Difference (null H = exogenous): chi2(1)    =   2.32  Prob > chi2 =  0.128
```

Appendix IV: Regression result of model III (MS as dependent variable)

Dynamic panel-data estimation, two-step system GMM

Group variable: BankID				Number of obs	=	180
Time variable : Year				Number of groups	=	17
Number of instruments = 67				Obs per group: min	=	9
Wald chi2(9) =	645.28			avg	=	10.59
Prob > chi2 =	0.000			max	=	11

log_MS	Coef.	Corrected Std. Err.	z	P>|z|	[95% Conf.	Interval]
log_TE	6.092124	3.360725	1.81	0.070	-.4947755	12.67902
log_SE	-10.39294	5.363615	-1.94	0.053	-20.90543	.1195571
log_CA	-1.231349	.6422701	-1.92	0.055	-2.490175	.0274777
log_AQ	.0951488	.1872312	0.51	0.611	-.2718177	.4621153
log_ME	-2.426099	1.751034	-1.39	0.166	-5.858063	1.005864
log_LIQ	4.953778	1.916802	2.58	0.010	1.196915	8.710641
log_GDP	-.110163	.1595703	-0.69	0.490	-.422915	.202589
log_INF	-.3166488	.1637207	-1.93	0.053	-.6375355	.004238
OWN	-1.553841	.9909826	-1.57	0.117	-3.496131	.388449
_cons	-2.011368	3.253665	-0.62	0.536	-8.388434	4.365698

```
Instruments for first differences equation
  Standard
    D.log_LIQ
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/10).log_CA
Instruments for levels equation
  Standard
    log_LIQ
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.log_CA
```

```
Arellano-Bond test for AR(1) in first differences: z =   0.43  Pr > z =  0.668
Arellano-Bond test for AR(2) in first differences: z =  -1.09  Pr > z =  0.275
```

```
Sargan test of overid. restrictions: chi2(57)   =  56.68  Prob > chi2 =  0.487
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(57)   =   7.55  Prob > chi2 =  1.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(47)   =   0.53  Prob > chi2 =  1.000
    Difference (null H = exogenous): chi2(10)   =   7.01  Prob > chi2 =  0.724
  iv(log_LIQ)
    Hansen test excluding group:     chi2(56)   =   6.51  Prob > chi2 =  1.000
    Difference (null H = exogenous): chi2(1)    =   1.04  Prob > chi2 =  0.309
```

Appendix V: Regression result of model III (HHI as dependent variable)

Dynamic panel-data estimation, two-step system GMM

Group variable: BankID				Number of obs	=	180
Time variable : Year				Number of groups	=	17
Number of instruments = 67				Obs per group: min	=	9
Wald chi2(9) = 10635.56				avg	=	10.59
Prob > chi2 = 0.000				max	=	11

log_HHI	Coef.	Corrected Std. Err.	z	P>|z|	[95% Conf.	Interval]
log_TE	15.71895	6.504588	2.42	0.016	2.970195	28.46771
log_SE	-21.3538	11.33829	-1.88	0.060	-43.57644	.8688505
log_CA	-2.348279	1.341921	-1.75	0.080	-4.978396	.2818384
log_AQ	.1121357	.3808612	0.29	0.768	-.6343385	.8586099
log_ME	-6.489578	3.613201	-1.80	0.072	-13.57132	.5921665
log_LIQ	8.974155	4.104133	2.19	0.029	.9302018	17.01811
log_GDP	-.2614911	.357107	-0.73	0.464	-.9614079	.4384257
log_INF	-.6850743	.357528	-1.92	0.055	-1.385816	.0156678
OWN	-2.805438	2.047268	-1.37	0.171	-6.81801	1.207134
_cons	-4.493003	6.915184	-0.65	0.516	-18.04651	9.060508

Instruments for first differences equation
  Standard
    D.log_LIQ
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(1/10).log_CA
Instruments for levels equation
  Standard
    log_LIQ
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    D.log_CA

Arellano-Bond test for AR(1) in first differences: z = 0.00 Pr > z = 1.000
Arellano-Bond test for AR(2) in first differences: z = -0.67 Pr > z = 0.501

Sargan test of overid. restrictions: chi2(57) = 58.17 Prob > chi2 = 0.432
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(57) = 8.40 Prob > chi2 = 1.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group: chi2(47) = 1.39 Prob > chi2 = 1.000
    Difference (null H = exogenous): chi2(10) = 7.01 Prob > chi2 = 0.724
  iv(log_LIQ)
    Hansen test excluding group: chi2(56) = 6.80 Prob > chi2 = 1.000
    Difference (null H = exogenous): chi2(1) = 1.60 Prob > chi2 = 0.206