



**SCHOOL OF POST GRADUATE STUDIES
ACCOUNTING AND FINANCE PROGRAM**

**THE EFFECT OF ELECTRONIC BANKING ON THE
PERFORMANCE OF COMMERCIAL BANKS IN ETHIOPIA**

**BY
SEBLEWONGEL TESHOME**

**June, 2024
Addis Ababa Ethiopia**

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**By
SEBLEWONGEL TESHOME**

**A Thesis submitted to the school of postgraduate studies in partial fulfillment
of the requirements for the Degree of Masters of Science in Accounting and
Finance program.**

Advisor: Abebaw Kassie (Assistant Professor)

Addis Ababa University

Addis Ababa, Ethiopia

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ENDORSEMENT

This thesis has been submitted to Addis Ababa University, school of postgraduate studies for examination with my approval as a university advisor.

Advisor: **Abebaw Kassie** (Assistant Professor)

Signature _____

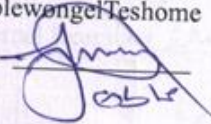


DECLARATION

I, Seblewongel Teshome, hereby declare that the thesis entitled "The effect of electronic banking on the performance of commercial banks in Ethiopia" is my original work. This study was conducted the partial fulfillment of the requirements of the MSC Degree in Accounting and Finance with the support of the advisor. I have carried out the study independently with the support and guidance of advisor, Abebaw Kassie (Assistant Professor), all source of materials used for the study have been duly acknowledged. Moreover, this study has not been presented for the award of any degree program in this and any other institution.

Name Seblewongel Teshome

Signature.



Approved By:

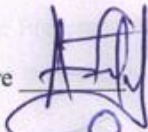
Abebaw kassie (Assistant Professor)


Signature

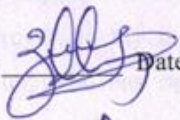


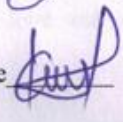
CERTIFICATE

This is to certify that the thesis entitled "The effect of electronic banking on the performance of commercial banks in Ethiopia", submitted to Addis Ababa University for the award Degree of Masters' in Accounting and Finance carried out by Seblewongel Teshome, under our guidance and supervision. Therefore, we hereby declare that no part of this thesis has been submitted to any other university or institutions for the award of any degree or diploma.

Name of Advisor Abebe K. Signature  Date 15/11/2024

Name of Internal Examiner Takete Fofa Signature  Date 29-08-2024

Name of External Examiner Lengnaw A. Signature  Date 9/10/2024

Name of head of Department Kelifa S. Signature  Date 12/10/2024

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Acronyms and Abbreviation

AIB: Awash International Bank S.C
ATM: Automated Teller Machine
BOA: Bank of Abyssinia S.C
CBE: Commercial Bank of Ethiopia
CLRM: Classical Linear Regression Model
DB: Dashen Bank S.C
DC: Debit Cards
DP: Deposit
EFT: Electronic Fund Transfer
E-banking: Electronic banking
FEM: Fixed Effect Model
HP: Hypotheses
IT: Information Technology
LIQ: Liquidity Ratio
LOG: Logarithm
MB: Mobile Banking
NBE: National Bank of Ethiopia
NIB: Nib International Bank S.C
OLS: Ordinary Least Square
POS: Points of Sale
REM: Random Effect Model
ROA: Return on Assets
ROE: Return on Equity
TPB: Theory of Planned Behavior
UB: United Bank S.C
VIF: Variance inflation factor
WB: Wegagen Bank S.C
TAM: The technology acceptance model

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Abstract

This study examines the impact of electronic banking (e-banking) on the performance of commercial banks in Ethiopia. This study examines how the adoption of different online banking channels such as ATMs, POS terminals; debit cards and mobile banking affect the financial performance and resource mobilization of commercial banks in Ethiopia. The study used an explanatory design and a quantitative research methodology. The profitability of commercial banks was measured and explained by ROA and ROE, and the quantity of deposits indicates how well the commercial banks mobilize resources. Debit cards, ATMs, POS systems, and M-Banking were the explanatory variables. In order to look into how bank size and bank liquidity affected bank profit, additional control variables were added. Several linear regression models were used to investigate the correlation. Data was analyzed using descriptive statistics and inferential analysis using Stata version 14 software. The finding reveals that number of ATM, number of POS and bank liquidity were the main contributors of bank performance. These e-banking channels have positive and significant effect on both ROA and ROE and deposit. Debit card (DC) has negative effect on ROA and positive but insignificant effect on ROE and deposit. Mobile banking and bank size affect the performance of the bank negatively. As a means of automating their banking system, banks are advised by the study to invest more in new e-banking channels like installing ATM that can accept deposit, digital lending and credit cared. Additionally, strategies involving partnerships and collaborations among commercial banks must be developed, to generate income by using other banks' ATM and POS.

Key Words: *E- Banking; Commercial banks; ROA; ROE; Profitability; Deposit*

CHAPTER ONE

1. INTRODUCTION

As an introduction of the study this chapter presents: background of the study, problem statement, general and specific objective of the study, research hypothesis, limitation and scope of the study, significance of the study and winds up with organization of the whole paper.

1.1 Background of the study

Electronic banking, also known as e-banking, is a payment system that allows banks or bank customers to conduct financial transactions such as deposit, withdrawal, loan payment, loan disbursement, bill payment, and transfer using developed infrastructure by financial institutions in a simple and convenient manner. It greatly reduces branch banking, which was the traditional way for physical customers to access (Smith, 2020).

E-banking was first proposed in the mid-1970s, and some banks began offering it to customers around 1985. However, due to a shortage of internet users and the fees involved with using online banking, little development in e-banking services was observed. People became more comfortable with online transactions after the internet boom of the late 1990s (Smith, 2020).

E-banking first appeared in Ethiopia in late 2001, when the largest state-owned bank, Commercial Bank of Ethiopia (CBE), began ATM service in the country with eight ATM machines, followed by Dashen Bank S.C. Since November 14, 2005, CBE has been a Visa member (Habte, 2019). Adaptation of e-banking were not fast growing in Ethiopia for different reason, the number of commercial banks that adapted e banking until 2015 were only 8 the rest were accepted the technology and e banking lately.

E-banking provides vivid benefit for customers and banks. For case of customer it helps to transact twenty four hours in a day and 7 days in week at or nearby station as per the preference of customer. It also decreases cash storage risk in the pocket or in house as well as searching the bank for deposit or withdrawal or transfer money. For the case of the financial institution e banking has many benefits. Major benefits are increase in accessibility to customer, decrease in branch expansion, minimize manpower requirement, minimize cost of handling small loans, increase product cross-selling, increase credit collection, minimize printing cost of cash notes, minimize cash holding cost, and automate dull tasks, decrease transaction error (risk is already transfer to customers)

having well organized data. This indicates that e-banking makes the bank efficient and profitable. It also serves for the bank as competitive advantage (Hasan O. & Talal B., 2012). In addition to these benefits electronic banking plays a significant role on creating cash less society, if the medium of transactions are cash notes the deterioration of the cash note will be increased and it creates additional cash note printing costs.

E-banking innovations are made by sound analysis of risks and costs associated so that to avoid harms on the bank performance. On one hand the bank performance is directly related to efficiency and effectiveness of electronic banking, but on the other tight controls and standards are needed to prevent losses associated with electronic banking. The banks have to balance these two options in order not to impair its overall prosperity. This is only possible if overall effects of electronic banking on the banks and its customers are understood. (Aduda and Kingoo, 2012).

The payment industry in Ethiopia over the last few years has been transformed with the new wave of IT advancements. Currently the use of cash to some extent has been changed by digital service most of the customer use digital banking than going to the bank to withdraw money. One of the reasons for the limited empirical studies in Ethiopia is that the introduction of electronics is relatively new in the country. The application of information and communication technology concepts, techniques, policies and implementation strategies to banking services has become a subject of fundamental importance and concern to all banks. Certainly, it is a must for local and global for competing and to maintain sustainability in banking industry. Hence, the advancement in technology has played a significant role in improving banking service delivery standards in the banking industry. Salem, Baidoun, and Walsh 2019

The Ethiopian banking system is underdeveloped compared to the rest of the world, there is an immediate need to embark on capacity building arrangements and modernize the banking system by employing the state of art of technology being used in anywhere in the world. It is therefore, important for bankers, bank regulators, supervisors and researchers to understand how investment on e-banking affects the performance of banks. Hence, the researcher main purpose in this paper is to providing systematic analysis of the effect of electronic banking on the performance of commercial banks in Ethiopia.

1.2 Statement of the problem

E-banking in Ethiopia has emerged as a strategic resource for achieving higher efficiency, control of operations and reduction of cost by replacing paper based and labor intensive methods with automated processes thus leading to higher productivity and profitability (Ayana, 2012). Currently, all commercial banks in Ethiopia has been deploying large number of ATM, POS machines and other e-banking service throughout the country by investing huge amount of money and striving to expand these electronic alternative self-service channels.

Banks began to look at e-banking as a means to replace some of their traditional branch functions, basically for two reasons. Firstly, branches were very expensive to set up and maintain due to the large overheads associated with them. Secondly, e-banking services like ATM banking and other electronic banking products are a source of differentiation for banks that utilized them. Being in a violently competitive industry, the ability of banks to differentiate themselves on the basis of price is limited. By considering this banks in developed and developing countries are implementing e-banking.

Electronic banking system has emerged to achieve the banking system and enable banks for the required vibrancy that is expected. It is expected that with the embrace and application of electronic banking in Ethiopian banking system, the performance and profitability of commercial banks become affected highly. However, the qualification of the exact impact of electronic banking on the bank performance has proved intangible. Knowledge of the exact contribution of e-banking will inform management investment decisions in technology and to take action for widening the services through different channels (Dawit & Adem, 2016).

Despite the aggressive expansion of electronic banking channels by Ethiopian commercial banks to enhance service delivery and profitability, research evidence on the impact of these changes remains limited. Empirical studies suggest that electronic banking has not yet had a significant independent effect on banking profitability. However, these findings may evolve as internet usage becomes more prevalent, potentially altering the role of electronic banking in the financial sector (Al-Shibly, 2011).

Commercial banks in developing country especially in Ethiopia faces many challenges in adopting new services such as poorly developed telecommunication infrastructure, lack of suitable e-commerce legal framework, lack of awareness, lack of skilled manpower, high rates of illiteracy,

low investments and others. However, the adoption and usage of e- banking is at promising stage not only in banks but also other institutions. So this system may influence the performance and efficiency of commercial banks (Akhisar et al., 2015; Bultum, 2014).

Numerous empirical studies have explored the influence of electronic banking on bank performance, particularly focusing on profitability using various metrics such as ROE, ROA, NII, NIE, and different ratios. Some researchers, like Aduda and Nancy Kingoo (2012), Jonathan O. Oniore, Uju V. Oko (2006 to 2017), Abdulganiyu Jimoh (2006 –2015), and Faith Kariuki (2015), have reported positive impacts, while others have found negative effects. Additionally, there are studies, like those by Tegenu (2020) and Tesfaw (2020),that highlight mixed impacts on bank profitability. However, these studies often reach inconsistent conclusions and employ varying methodologies and variables. This research aims to address these gaps by investigating the impact of e-banking channels on both bank profitability and deposit growth, offering insights for decision-makers.

1.3 Research Question

1. How the number of ATMs have an effect on the performance of Ethiopian commercial banks?
How is the level of that impact?
2. How the number of POS have an effect on the performance of Ethiopian commercial banks? What is the extent of that effect?
3. How the number of DC users have an effect on the performance of Ethiopian commercial banks?
What is the extent of that impact?
4. How the number of mobile banking users have an effect on the performance of Ethiopian commercial banks? What is the extent of that impact?

1.4 Objective of the study

1.4.1 General objectives of the study

The study has a general objective of investigating the impact of E-banking on the performance of commercial banks in Ethiopia.

1.4.3 Specific objectives of the Study

The specific objectives that are desire to be achieved through this study are:

1. To examine the influence of number of ATM on the performance of commercial banks in Ethiopia.
2. To scrutinize the influence of number of POS on the performance of commercial banks in Ethiopia.
3. To test the influence of number of DC users on the performance of commercial banks in Ethiopia.
4. To observe the influence of number of mobile banking users on the performance of commercial banks in Ethiopia

1.5 Research Hypothesis

Hypotheses are guesses about what will happen, and they can be written as alternate hypotheses that tell us exactly what we should expect. They can also be written in the form of a null, meaning there's no difference or relationship between groups when it comes to a dependent variable. The empirical and theoretical literature both show that e-banking affects commercial banks' performance both good and bad. But when it comes to the wide use of e-banking channels, most of the studies show that it's good for commercial banks to use e-banking products. The based on the research objectives the researcher prepares the following hypothesis:

Hypothesis 1: Number of ATM machines have a positive effect on the performance of commercial banks in Ethiopia.

Hypothesis 2: Number of POS terminals have a positive effect on the performance of commercial banks in Ethiopia.

Hypothesis 3: Number of users of Bank Debit card has a positive effect on the performance of commercial banks in Ethiopia.

Hypothesis 4: Number of Mobile Banking users have a positive effect on the performance of commercial banks in Ethiopia.

1.6 Scope and limitation of the study

This study focused on selected Commercial Banks that had been licensed by the National Bank of Ethiopia and were using electronic banking services. The units of analysis were those that were still in operation on June 30, 2023. The paper looked at bank electronic channels like ATMs, POS,

debit cards, and mobile banking. It also looked at the performance of the banks, when it came to financial performance using ROE and ROA, are the variables that measure the profitability of the bank and the deposit performance of the commercial banks measured by the growth of the amount of deposit year on year deposit. The ROE is the common and the most relevant measurement of performance for shareholders. The return on equity is a profitability ratio used to evaluate the company's performance to generate income from the invested capital by shareholder's (Bourke, 1989). ROA is a profitability ratio that provides how much profit a company can generate from its assets. In other words, return on assets (ROA) measures how efficient a company's management is in earning a profit from their economic resources or assets on their balance sheet. Deposit mobilization refers to the process of collecting and accumulating funds from the public through various deposit schemes offered by financial institutions. It is a crucial part of banking activity and plays a significant role in the growth of the economy. Monitoring deposit growth provides insights into the bank's capacity to expand its operations, lend money, and generate interest income. Additionally, deposit growth is often considered a key indicator of a bank's stability and liquidity.

By examining these variables in relation to electronic banking channels, the study aimed to provide a comprehensive understanding of how these technological advancements impact both the profitability and deposit performance of commercial banks.

The study used data from 10 Commercial Banks in Ethiopia that had been using electronic banking since 2017. Selecting 10 commercial banks could be based on factors such as the prevalence and diversity of electronic banking adoption among these institutions. It's possible that these 10 banks were among the early adopters. The study used data for 7 years from 2017 to 2023 to see how the effects of electronic banking on commercial banks affecting their performance within these seven years. Because it represents a significant timeframe to observe the effects of electronic banking implementation on bank performance. Seven years allows for a comprehensive analysis of trends and patterns over time. As this is a secondary data analysis, there are some inherent limitations that affects the results. If data from annual reports and other sources are not readily accessible, it could delay the research process and potentially bias the results if certain data points are missing or incomplete. The data is sourced from the National Bank of Ethiopia and annual financial report of each commercial bank. As a result, the study's scope and outcomes is constrained. The lack of ready data of the variables severely limits the researcher's ability to conduct the study. The data used in this study would likely include financial data such as balance sheets, income statements,

and other relevant financial metrics from the selected commercial banks. Additionally, data on electronic banking adoption, usage, and performance indicators would be necessary to assess the impact on bank profitability and deposit growth. This could include metrics such as the number of electronic transactions, customer adoption rates, and technological infrastructure investments. Depending solely on secondary data sources like annual reports and national bank data might limit the richness and granularity of the data available for analysis. There could be discrepancies or inconsistencies in the data, impacting the reliability and validity of the research outcomes.

1.7 Significance of the study

The study is anticipated to be significant in a number of ways, and the executives of commercial banks in Ethiopia will find its results extremely valuable in understanding how the performance of commercial banks is impacted by electronic banking. They can use this information to help them decide whether to adopt electronic banking, whether to invest more money in it, and what impact it will have on their bank's performance.

This study is significant because it will educate accountants on the best ways to use e-banking products to produce the information necessary for the organization's survival, growth, and profitability. This study has significant benefits for managers and students alike because it keeps them abreast of emerging business trends and technological advancements.

The employees will be made aware that using e-banking will boost productivity in the company. The studies also educate public and private organizations on how to work with commercial banks to improve their operations by utilizing e-banking channels. The study is important for bank executives, investors, policymakers, and interested customers to develop better strategies that let commercial banks offer quick and convenient service.

1.8 Organization of the paper

The thesis will be organized into five distinct chapters in which the first chapter presents introduction to the study. The literature review part of the study is presented in chapter two which includes theories, empirical evidences, knowledge gaps and conceptual frame work. Chapter three presents the research design and methodology adopted to complete the study effectively and efficiently. Chapter four come with data presentation, analysis and interpretation. The final chapter winds up with conclusion and forwarding recommendation based on the result of the study.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Introduction

This chapter contains the literature related with e-banking. Accordingly, the review of the literature is divided into two parts. The first part discusses the theoretical foundation for the study, while the second part presents the empirical studies. Under the theoretical Review of related literature, the concept of Electronic banking, overview of financial Performance, the effect of E-banking on performance of Commercial Banks, Theory of Financial Intermediation, Innovation Diffusion Theory, Technology Acceptance Model, Benefits and Challenges of Adoption of E-Banking, Types of E-banking are presented. The review of empirical studies is done on the e-banking on bank performance, and the gaps that necessitate this study.

2.2 Theoretical Review of Related Literature

2.2.1 Electronic banking

Customers can conduct transactions electronically through e-banking without physically visiting a bank branch (Simpson, 2002). E-banking, as it has just been described, saves customers valuable time because they are not required to visit any bank branches in order to conduct business, and it gives banks the chance to broaden their customer base in order to boost business profitability (Okibo and Wario, 2014). Outside of regular business hours, it also provides banking services. It is possible to access the bank account for 24 hours/7 days (Fenuga OJ, 2010).

E-banking, in general, refers to a system that gives individuals, customers, and even businesses the ability to check their accounts, conduct transactions, and gather useful information on financial services and products from both private and public networks. Compared to manual or branch-based banking, customers can access and complete their banking transactions with e-banking with less effort.

A bank that makes use of new banking tools will be successful in providing customers with high-quality services and maximizing profit. E-banking is a rapidly gaining service that enables customers to use a computer to access account-specific data and possibly direct exchanges from a distance. Accordingly, banks are the primary forces behind technological innovation and

revolution as well as the early adopters of new technology. Because of its comfort, adaptability, and simplicity, e-banking has gained popularity. Additionally, it generates benefits related to transactions such as quickness, effectiveness, simplicity, convenience, and accessibility (Eze & Egoro, 2016).

2.2.2 Financial Performance of banks

Financial performance refers to the monetary evaluation of an organization's operations and policy outcomes. Return on investment, return on assets, value added, and other metrics for the company reflect these outcomes. This phrase is also used to compare similar businesses within the same industry or to compare entire industries or sectors in aggregate. It serves as a general indicator of a firm's overall financial health over a specified period of time. One advantage that banks receive from the delivery of electronic banking products and services is increased operational effectiveness and efficiency, allowing them to process more transactions more quickly and conveniently, which will undoubtedly have a significant impact on the bank's overall performance. According to Kariuki (2005), the use of e-banking can improve bank performance in terms of increased market share, a wider selection of products, specialized goods, and a better ability to meet customer demand.

2.2.3 Effect of E-Banking on Performance of Commercial Banks

Profit maximization is the main goal of most companies, without profit the company cannot survive in the long run. Therefore, measuring and evaluating past and current profitability is very important for banks. Profitability is measured by revenues and costs. Income is generated from the core business of providing excellent and innovative service to interested customers. Costs are fees that are recorded in the revenue generation process and can be minimized with a simple and fast delivery system. Internet banking channels facilitate the operation of banks, which allows them to collect large revenues and reduce operating costs. According to Nathan (1999), electronic banking has brought many benefits to both banks and customers. The first advantage of banks in offering online banking services is better branding and better responsiveness to the market. It also has very favorable payment transactions compared to a bank. Commercial banks that aggressively offer electronic banking are considered leaders in technology adoption. As a result, they would enjoy a better brand image (Vekya, 2017). Other benefits can be measured in money. The main goal of any business is to maximize the profits of its owner and shareholders. The main benefits for customers are time saving, ease, convenience and cost saving in accessing and using various

banking products and services (Pyun, Scruggs and Nam, 2002). According to Wright and Ralston (2002), online banking reduces the following costs: (1) banks can reduce staff when customers adopt self-service; (2) Check processing costs are lower due to the rise of electronic payments. (3) Online submission of statements and information reduces paper and postal delivery costs; (4) less data when customers complete and process applications online. On the other hand, according to Cruz, Neto, Munoz-Gallego and Laukkanen (2010), banking revenues increase due to Internet banking: increase in account sales; wider market area; new fee-based income; new marketing opportunities and improved customer satisfaction. Online banking offers customers ease of use, lower service fees and access to banking information.

2.2.4 Theory of Financial Intermediation

Because there is an information asymmetry between borrowers and lenders, financial intermediaries exist primarily to reduce the information and transaction costs that result from this asymmetry. Due to their capacity to infuse the economy with liquidity by serving as a financial intermediary between savers and borrowers, electronic banking has long been acknowledged to play a significant role in economic development. Additionally, it provides financial services and goods that hasten the settlement of transactions and, as a result, decrease the amount of cash in the financial system, promote banking culture, and spur economic growth (Al-Gahtani, 2001). However, in order for the financial system to operate effectively, the payment systems must be reliable and effective; otherwise, they could serve as a channel for the spread of problems from one area of the economy or financial system to another. This is the reason that central banks have taken steps to support a reliable and effective payments system and to find ways to lower systemic risks (Al-Gahtani, 2001).

2.2.5 Innovation Diffusion Theory

Rogers stated in 1995, as cited by Juddy Maiyo (2009), "New information technologies represent innovations for potential adopters: an idea, practice, or object that is perceived as new by an individual or other unit of adoption. An innovation is an idea, practice, or object that a person or other adoption unit perceives as novel. Rogers' theory of the diffusion of innovations is a well-known and enduring conceptualization of innovation adoption behavior. How to accelerate the rate of diffusion of an innovation is a common issue for many people and organizations (Rogers 2003). The social system in which adopters are situated is a conduit for information about an innovation's

existence as well as its qualities and features. To find out what the expected effects of using the innovation will be, prospective adopters engage in information seeking behaviors.

The process of diffusion is how a new innovation gradually spreads among the people in a social system through specific channels. Diffusion, then, is a special kind of communication where the messages are focused on a novel concept. What gives diffusion its unique character is the freshness of the ideas in the communication's message content. Or to put it another way, diffusion is a type of social change, which is the process by which a social system's structure and operation are altered. Consequently, it is difficult to diffuse an innovation into a system.

2.2.6 Technology Acceptance Model

The technology acceptance model (TAM), first put forth by Davis in 1986, is one of the well-known models relating to technology acceptance and use. People "adopt an application primarily because of the functions it performs and secondarily because of the ease or difficulty associated with making the system perform these functions," according to Davis (1989). TAM has demonstrated to be a theoretical model in aiding to explain and predict user behavior of information technology, according to (Legris, Ingham, & Collette, 2003). TAM offers a framework for tracing the effects of outside factors on beliefs, attitudes, and use intentions. Technology acceptance model is used to explain how banks adopt electronic banking. Perceived usefulness and perceived ease of use are the two cognitive beliefs that TAM proposes. According to TAM, a user's behavioral intentions, attitude, perception of the system's utility and perceived ease of use all have an impact on how much of a technology system they actually use.

2.2.7 Benefits and Challenges of Adoption of E-Banking

For both banks and customers, e-banking offers a number of benefits. It has greatly simplified life and sped up banking for both customers and banks. According to Okiro and Ndungu (2013), there are many uses for electronic banking in the contemporary financial system.

Benefits for banks offering e-banking services include better market responsiveness. The banks that provide these services are ostensibly leaders in integrating new technology into their banking operations. To that end, the self-service component of online banking can significantly improve banks' operational efficiency. It helps to increase banking transactions while also steadily bringing down the bank's operational costs. Reduced costs for accessing and using banking services, as well as convenience and speed, are e-banking's main benefits for customers.

The benefit of using e-banking is its ability to provide services much more quickly for both customers and banks, save time, and offer options for international banking and other services. Language Barriers, since e-payment system instruments only offer a service in a small number of languages, are among the difficulties associated with e-banking services. Additionally, banks' localization efforts have resulted in significant time and energy investments as well as costs that add to the price of purchasing an e-banking application. It has been difficult to implement the service here in the third world without an adequate IT Infrastructure because electronic banking requires telecommunications services like mobile network connectivity and Internet service. Electric power outages, a lack of awareness, and other issues have made it difficult to provide the service with the expected level of quality.

2.2.8 Types of E-banking

The common types of e-banking include the following:

A. Mobile Banking

Mobile banking allows users to access their accounts, view their activities, make payments, and transfer funds using smartphones or other mobile devices. Designed for convenience on the go, mobile banking provides easy access to banking services anytime, anywhere through mobile apps. Additionally, mobile banking offers features like biometric authentication for added security and peace of mind. [Electronic-banking-e-banking-types-features-advantages/\(internate\)](#)

B. Electronic funds transfers (EFT)

The electronic exchange or transfer of money from one account to another using computer-based system is known as an electronic funds transfer, or EFT, according to Bahia (2007). Another method of transferring money directly between bank accounts without using paper money is called Electronic Funds Transfer (EFT). Checks, stamps, envelopes, and paper bills will eventually become obsolete thanks to the growing acceptance of EFT for online bill payment. Electronic funds transfer (EFT) is the process of electronically moving money from one bank account to another, either within a single financial institution or between institutions, using computational infrastructure and avoiding the use of human labor directly.

C. POS Banking

Banks employ computer devices called point of sale terminals, or POS machines, to process and bulk up payments at retail establishments. Typically, a POS terminal reads the data from an ATM

card and a customer's credit or debit card. Verify if there are enough funds in a customer's bank account to complete the necessary transaction.

A transaction takes place at the point of sale (POS), also known as the point of purchase (POP) or checkout. The hardware and software used for checkouts, which is comparable to an electronic cash register, is referred to as a POS terminal or checkout. A salesperson's ease of accessibility is managed by the point of sale. The receipt can be created and printed using the same system. These automated systems have largely taken the place of traditional manual cash registers at the checkout counters in shops, restaurants, theaters, and anywhere else that accepts debit cards.

D. Internet banking

Internet banking, also referred to as online banking, e-banking, or virtual banking, is an electronic payment system that enables customers of a bank or other financial institution to carry out a variety of financial transactions through the financial institution's website. Based on Eglund et al. PC banking has evolved into Internet banking, also known as online banking, as of 2008. When conducting banking transactions such as money transfers, bill payments, checking and savings account balance checks, mortgage payments, and the purchase of securities and certificates of deposit, internet banking uses the Internet as the delivery channel.

E. ATMs An automated teller machine (ATM),

An automated teller machine (ATM) is a device that allows transactions to be completed without the involvement of a human cashier or teller. Anytime, transactions like cash withdrawals, deposits, money transfers, or getting account information are supported. According to Thompson (1997), authentication is provided by the customer entering a personal identification number (PIN), which is a computerized telecommunications device that gives the customers of a financial institution access to financial transactions in a public setting without the need for a cashier, human clerk, or bank teller.

2.2.9 The Relationship between Electronic Banking and Growth in Deposits

Numerous studies have shown that the introduction of electronic banking has brought remarkable improvement in the ways banking is conducted. For example, Alagheband (2006) in their study, the impact of electronic banking on growth of customer deposits in the Nigerian banking industry found that the introduction of electronic banking innovations opened more channels and opportunities for diverse means of increasing customer deposits. The findings further revealed that these innovations also enhanced efficiency and effectiveness in service delivery since the

customers were exempted from visiting the banking hall. According to Kolodinsky (2004) electronic banking systems has enlarged product lines and also improved delivery channels such as mobile and internet banking. This has provided an opportunity for all classes of customers to save and accumulate their money for future investments. This has boosted growth of customer deposits since these channels are convenient and efficient to access. This is in line with a study conducted by Afolabi (2009) investigated the impact of mobile banking on growth of customer deposits. The findings of this study depicted that there was a positive relationship between use of mobile banking transactions and growth of customer deposits. The study further revealed that use of mobile banking was economical, convenience and efficient according to most of the customers. Most customers revealed that they deposited their money using mobile phone. Through electronic banking, banks can easily interact with their customers through information on their performance and also educating the customers about the products and services available based on their needs. This encourages customers to invest with the bank since they are confident about its performance and thus improves deposits since customers have a lot of trust with the bank (Al Gahtani, 2001).

2.3 Empirical literature Review

2.3.1 Empirical studies related to E-Banking in some African countries

Jonathan O. Oniore. And , Uju V. **Okoli** conducted study on ‘Impact of Electronic Banking on Performance of money deposit bank in Nigeria’ from 2006 to 2017 using time series quarterly data. The study adopted Ordinary Least Squares as main tool of analysis. Findings from the study revealed that e-banking has gradual positive impacts on the banks performance in Nigeria, thus can contribute to the economic acceleration process.

Abdulganiyu Jimoh conducted study on “Effect of Electronic Banking on the Profitability of Deposit Money Banks in Nigeria” The methodology of the study was quantitative in nature. Using time series data of 2006 – 2015, the study employed regression technique in the analysis of sourced data. Data were collected from secondary sources. As such, E-banking has a positive effect on Profitability of deposit money banks in Nigeria

Josiah Aduda and Nancy Kingoo (2012) conducted study on “The Relationship between Electronic Banking and Financial Performance among Commercial Banks in Kenya” Specifically, the study established whether there is relationship between the dependent variable i.e., performance measured by return on assets and the independent variables: investments in e-banking, number of

ATMS and number of debits cards issued to customers as proxy for e-banking. The study used secondary data. The data was collected from annual report of target banks and Central Bank of Kenya. The study used both descriptive and inferential statistics in analyzing the data. In general the study revealed that e-banking has strong and significance marginal effects on returns on asset in the Kenyan banking industry. Thus, there exists positive relationship between e-banking and bank performance.

Asia Ngango, Dr. Mbabazi Mbabazize, and Dr. Jaya Shukla (2015) conducted research on "E-banking and commercial bank performance in Rwanda: a case study of the Bank of Kigali." In order to obtain a better analysis of the study, the study used a descriptive research design based on a qualitative and quantitative approach. In order to obtain the necessary data, both primary and secondary data collection tools, as well as relevant tools such as questionnaires and documentary analysis, were used. According to the findings, electronic banking systems such as ATMs, Pay direct, electronic check conversion, mobile telephone banking, and E transact have a significant impact on bank performance because they increase profitability, reduce bank operating costs, and increase bank asset and bank efficiency. The result of the study showed that there is a significant relationship between E banking and Performance of bank of Kigali in Rwanda. As conclusion E banking contributes to positive performance of banks as witnessed by of bank of Kigali

Faith Kariuki (2015) conducted study on 'The Effect of Electronic Banking on Growth of Customer Deposits of Microfinance Banks in Kenya' A descriptive survey was used in the study to determine the relationship between electronic banking and growth in customer deposits. Because of the rapid adoption and use of electronic banking services and products as tools for enhancing their level of competitiveness and growth in customer deposits, the study focused on microfinance banks. A census survey of nine (9) microfinance banks that had been in operation for five years (2010-2014) was used in the study. The study relied on secondary data obtained from the central bank of Kenya audited reports of the nine microfinance banks. Descriptive statistics, correlation analysis, and regression analysis were used in the data analysis. The descriptive findings revealed an increase in ATMs of microfinance banks, indicating increased use of electronic banking. As a result of the findings, it is concluded that the use of electronic banking resulted in an increase in customer deposits. According to the study, there is a strong correlation between the increase in automated teller machines and the increase in customer deposits. In the

model, the increase in ATMs was found to be statistically significant. This study focusses on the microfinance bank only.

2.3.2 Empirical studies related to E-Banking in Ethiopia

Solomon (2016) studied the impact of electronic banking on the financial performance of Ethiopian commercial banks from 2013 to 2015. He investigated the effects of e-banking on return on assets and also used secondary data. According to the study, increased ATM, POS, and market share played a positive role in commercial banks' financial performance, with many banking institutions indicating that increased market share allowed a company to achieve greater scale in its operations, which generally improved its profitability. However, Solomon worku 2016 does not include the ROE in his research study. But as far as ROE is a true bottom-line profitability metric, comparing the profit available to shareholders to the capital provided or owned by shareholders it is advisable to assess its impact.

Tegenu (2020) studied the effects of Electronic Banking on bank Performance of selected Commercial Banks in Ethiopia. The study focused on eight commercial banks in Ethiopia and used a quantitative research design. It analyzed secondary data from the banks' annual reports and websites, utilizing both descriptive and inferential statistics, such as panel data, linear regression modeling, and Pearson correlation analysis. The results showed that the value of ATM and POS terminal transactions had a positive relationship with return on equity (ROE), while the value of mobile bank transactions had an insignificant relationship with ROE. The value of ATM transactions had a negative and significant linear relationship with ROA. The study's findings indicate that while certain independent variables had a positive impact on ROE and ROA, others had a negative impact.

Tesfaw (2020) conducted a research on The Effect of Electronic Banking on the Profitability of Commercial Banks in Ethiopia with an explanatory design, the study used a quantitative research methodology. Bank profitability was quantified and explained using ROA and ROE. ATM, POS, M-Banking, and debit cards were the explanatory variables. Additionally, control variables for bank liquidity and size were used to look into how they affected bank profit. For a period of seven years (2013-2019), the audited financial statements of ten commercial banks that were specifically chosen from NBE were the subject of a panel-based collection of secondary data. To investigate the relationship, multiple linear regression models were used. Data was analyzed using descriptive statistics and inferential analysis. The findings indicate that the number of ATMs, POS terminals,

and bank liquidity were key factors contributing to bank profitability. These e-banking channels have a positive and significant impact on both Return on Assets (ROA) and Return on Equity (ROE). However, the number of debit cards (DC) issued has a negative effect on ROA and a positive, though insignificant, effect on ROE. Additionally, mobile banking and bank size negatively influence profitability.

Bethelhem (2018) conducted a study on E-banking Services and Performance of Top Performer Commercial Banks in Ethiopia the study employed a quantitative approach-based explanatory method of investigation. Eleven Ethiopian commercial banks that operated during the 2013–2017 period were the population of interest in this study. Of those, nine were chosen through the use of a purposive sample technique. Secondary data were used in the study. Both descriptive and inferential statistics were employed in the study's data analysis. Using E-views9 econometric software, the results of fixed effect panel least square regression showed that: increasing the number of ATMs has a negative and significant impact on bank ROA; increasing the number of POS has a negative and insignificant impact on bank ROA; and increasing the number of mobile banking users has a positive and significant impact on bank ROA. However, Bethelhem (2018) does not include the ROE in her research study. But as far as ROE is a true bottom-line profitability metric, comparing the profit available to shareholders to the capital provided or owned by shareholders it is advisable to assess its impact.

Muhammednur (2019) conducted a research on Effects of Electronic Banking Services on Financial Performance of Selected Commercial Banks in Ethiopia the study looked at how automated teller machines, point of sale, internet, and mobile banking affect the profitability and cost efficiency of selected commercial banks in Ethiopia. A quantitative approach was used in the explanatory research design. The study relied on secondary data from seven purposely chosen commercial banks from 2013 to 2018. The data was analyzed using both descriptive and inferential statistics, as well as a panel data regression model. The study's findings, based on a fixed effect panel data model, show that ATM usage, mobile banking, and bank size all have significant positive effects on ROA. The use of POS banking, on the other hand, had a significant negative impact on ROA.

Most researchers, according to the empirical studies mentioned above, have reached similar conclusions regarding the overall effect of e-banking on profitability. However, the impact of individual variables varies, and many researchers, as cited in the literature, have primarily

measured bank performance through profitability, without examining how deposits are influenced by e-banking. For example, while Muhammad and Bethelhem found that mobile banking has a positive effect, Tegenu and Tesfaw reported a negative effect. Similarly, ATM usage was found to have a positive impact on the performance of commercial banks by Tesfaw and Tegenu. This inconsistency in findings prompted the need for further research. This study focuses on investigating the effect of e-banking on both the performance of deposits and profitability. Certainly, addressing the research gap by investigating the impact of e-banking on bank performance is crucial. To construct a thorough study, it's essential to outline the variables that will be examined. Here are some key variables to consider:

Electronic Banking Adoption: This variable measures the extent to which banks have implemented electronic banking channels such as online banking, mobile banking, ATMs, and POS systems.

Bank Performance Metrics:

Return on Equity (ROE): This metric evaluates the profitability of the bank by measuring how efficiently it utilizes shareholder equity to generate profits.

Return on Assets (ROA): ROA assesses the bank's profitability by gauging how effectively it utilizes its assets to generate earnings.

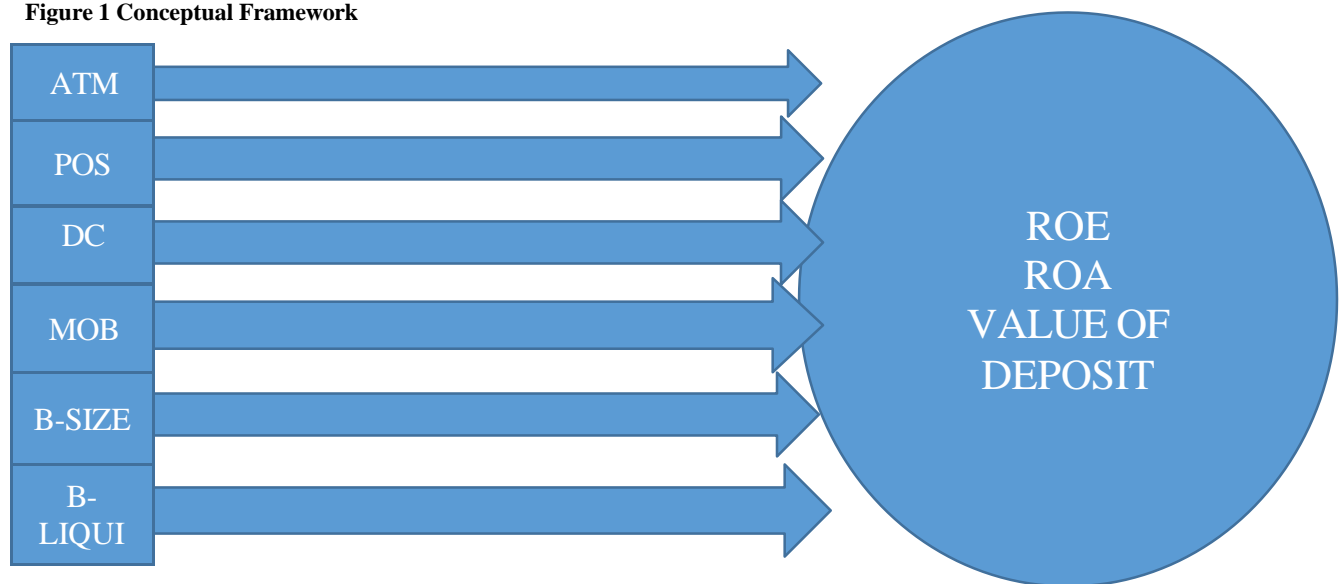
Deposit Growth: This variable tracks the year-on-year increase in the amount of deposits held by the bank, reflecting its ability to attract and retain customer funds.

Control Variables: These variables help to control for external factors that may influence bank performance, such as economic conditions, regulatory environment, and competitive landscape. By examining these variables in the context of electronic banking adoption, the researcher can provide valuable insights into the relationship between e-banking and bank performance, contributing to the existing literature and filling the identified research gap.

2.4 Conceptual framework

Conceptual framework Therefore, after going through tremendous literatures (journals, articles, books and etc.) the researcher has tried to build a conceptual framework of the study. From the theoretical and empirical literature reviews, the following conceptual framework of the study is developed by the researcher.

Figure 1 Conceptual Framework



Source: designed by the researcher

CHAPTER THREE

3. RESEARCH DESIGN AND METHODOLOGY

This chapter deals with the design and methodologies of research that have been used to carry out the study. The chapter includes research approach, study design, data collection, sampling technique, data type, analysis of data and model specification.

3.1. Research approaches

There are three different types of research approaches, according to Creswell (2009): the first is qualitative research, which uses newly emerging questions and techniques and typically gathers data in the participant's environment. Quantitative research, which tests objective theories by looking at how variables relate to one another, is the second method. Numbered data can be estimated and analyzed using statistical methods because these variables can be measured with instruments. The final one is mixed method research, which is a method of inquiry that also associates or combines both qualitative and quantitative forms. The quantitative research approach is determined to be appropriate for this study after taking into account the research problem or issue under consideration, objective, the philosophy of the various research approaches, and the quantitative nature of the data.

3.2. Research design

The conceptual framework of a research design determines how findings are conducted in relation to a paradigm. Data collection, measurement, management, and analysis are centered on it (Kothari, 2004). The three main goals of conducting research, according to Robson (2002), are as follows. Exploratory research is defined as the search for novel understandings, the observation of phenomena and the posing of new questions. Second, through the post-positivist paradigm, explanatory research seeks to understand a particular situation or issue through causal relationships. Last but not least, descriptive design is a type of research that focuses on using a constructive paradigm to describe the nature or condition and the level of detail of the current situation. Examining how e-banking affects commercial banks' performance is the goal of this study. A quantitative approach and an explanatory type of research design were used to achieve this goal. The main justification for choosing an explanatory research design is that it can be used to understand, explain, and predict relationships between variables in addition to demonstrating

how one variable influences or is accountable for changes in another (Cooper and Emory, 2006). Therefore, it has been crucial to examine the connection between the use of e-banking services and the performance of commercial banks using an explanatory research design. The explanatory type of research design aids in determining and assessing the causal relationships between the various variables under consideration (Marczyk, DeMatteo, & Festinger, 2005). In order to examine the relationship between the stated variables in this study, an explanatory research design has been used. The study's objective was accomplished by using a panel data that includes time series data and a cross section (across firms). Panel data analysis has the benefit of allowing for the acquisition of more accurate parameter estimates for the model (Gujarati, 2009).

3.3 Population of the study and Sampling Techniques

The researcher wants to generalize the study's findings to a group of people who share some observable traits (Mugenda & Mugenda, 2003). Currently there are 30 commercial banks in Ethiopia, 29 commercial banks and one development bank. Number of Ethiopian commercial banks has increased from 18 to 31 within four years' time (NBE, Dec 2023).

The target populations of this study become all commercial banks operating and providing service in Ethiopia. While Ethiopia's Commercial Bank was the first to use e-banking in 2001, most other commercial banks have recently adopted this service. Since electronic banking technology has been used by the majority of commercial banks recently, it is possible to obtain complete data on e-banking channels in Ethiopian commercial banks since 2017. Since electronic banking technology has been used by the majority of commercial banks recently, it is possible to obtain complete data on e-banking channels in Ethiopian commercial banks as of 2017. As a result, banks that have arranged for an e-banking service and reported to NBE since 2017 are regarded as a sample frame.

From the thirty commercial banks operating in Ethiopia, this study selected 10 banks using purposive/judgment sampling technique. These banks are Awash International Bank, Bank of Abyssinia, Commercial Bank of Ethiopia, Cooperative Bank of Oromia, Dashen Bank, Oromia Bank, Nib Bank, United Bank, Wegagen Bank, and Zemen Bank. The purposive sampling approach was used to generate meaningful insights that help to gain a deeper understanding of the research phenomena by selecting the most informative participants suitable for the study's specific needs. The researcher believes that the sample size is sufficient to draw sound conclusions about

the population. The banks selected have readily available information and higher levels of information disclosure, particularly regarding e-banking channels. This ensures that the necessary data for analysis can be accessed efficiently. The banks have been using electronic banking since 2017, providing a consistent timeline for evaluating the impact of e-banking on their performance over a seven-year period.

3.4. Data Type and Source

Information must be obtained from reliable sources in order to conduct any kind of research. Using the right data collection tools during research increases the validity and significance of the findings, according to consistent and trustworthy research (Cooper & Emory, 2006). Secondary sources served as the data sources for this study. Using secondary data acquired from the National Bank of Ethiopia and publicly available annual reports of particular commercial banks, the study used a quantitative research methodology.

We use and cite financial statements and other published and unpublished documents appropriately from internal report of the banks. Panel data aggregates elements or observations across bank cross sections over multiple time periods to produce results not seen in pure time series or simple cross sections (Brooks, 2019). Moreover, panel data sets offer multiple observations within the sample and track the historical sample of observations over time. Panel data, according to Brooks (2019), has two main benefits: first, it can handle a wider range of issues and more complex problems than pure time series or pure cross-sectional data alone, and it can appropriately structure the model. Second, an analysis of the connections between variable changes is frequently conducted.

The researcher can therefore increase the number of degrees of freedom by combining cross-sectional data and time series data. On the other hand, panel form takes into account the heterogeneity that exists within specific commercial banks. And permit the investigation of every element with the least amount of inter-variable co-linearity, greater degree of freedom, and increased efficiency.

This study is based on secondary data collected from seven years (2017-2023), on the bank performance indicators and e-banking channels. The data will obtain or collect from the audited financial statements of each selected commercial banks and national bank of Ethiopia. Thus were;

ROA, ROE, Value of Deposit, number of ATM, number of POS, mobile banking users, debit card users for the selected commercial banks.

A multiple linear regression test will use to determine the significance level of each explanatory variable in affecting bank performance. The study utilized a fixed effects (FE) multiple linear regression model to analyze the effect of e-banking on the performance of commercial banks in Ethiopia through STATA econometric software version 14. Accordingly it is adopted to test the casual relationship between the banks' DEPOSIT, ROA & ROE and electronic banking in order to determine the effect on the performance of Banks in Ethiopia.

3.5. Data analysis

Seven years (2017–2023) of panel data from ten commercial banks will be used to meet the study's general objectives. Organized document review will be used to gather the data. Descriptive statistics, correlation analysis, and multiple linear regression analysis will all be used to evaluate and interpret the panel data that has been gathered.

Using a sample of ten commercial banks, descriptive statistics analysis will be used to examine general trends in the data from 2017 to 2023. The mean, standard deviation, maximum, and minimum values will be investigated. In this study, the relationship between deposit, return on asset, and return on equity with its determinants will be estimated using regression analysis, the study used a multiple regression model based on ordinary least square (OLS) techniques to determine the effect of electronic banking on the performance of commercial banks. According to Gujarat (2003), the preference for the OLS method is necessary due to the simplicity of the calculation procedure compared to other estimation methods. The OLS method also benefits from its smaller variance compared to all other linear unbiased estimators; they are normally distributed and linear; they are effective; they are also symmetrically unbiased. The study used STATA version 14 for analysis of the data.

3.6 Model Specification

To determine whether the independent variable has an effect on the dependent variable, a straightforward linear regression model is used. This model only has one explanatory variable and one explained variable. A multiple linear regression model is appropriate to test the significance

of the explanatory variables to explain the change in the dependent variable when there is more than one (Brooks, 2019).

According to the literature that was thoroughly reviewed in the previous chapter, a multiple linear regression model is used to analyze how e-banking affects commercial banks' performance. The researcher will use a model that will help illustrate how some important variables that have significant impact on the performance of commercial banks in Ethiopia can be responsive based on the framework of analysis used in these studies. For a quantitative study to show the connection between observations and the mathematical expression of numerical relationships, measurement is necessary (Brooks, 2019).

Ordinary least squared (OLS) model also adopted to test the statistical significance of the various independent variables (Number of ATM, Number of POS, Number of debit cards and Number of mobile banking) control variables (bank size and bank liquidity) and the explained variable (DEPOSIT, ROA and ROE).

According to Brooks (2019), the general multiple linear regression models used in examining the effect of electronic banking channels on the performance of commercial banks in Ethiopia will be presented as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \dots + \beta_k X_{kit} + \epsilon_{it} \quad (k = 1, 2, 3 \dots n)$$

Where: i- Refer to the commercial bank;

t- Refers to year;

Y- Is the dependent variable which refers value of DEPOSIT, ROE and ROA for bank i in a particular year t;

X_{1it}...X_{kit}- represents the explanatory variable which is Electronic Banking channels;

β₀... β_k- are the regression coefficients, and

ε_{jt} - represent the error term which is assumed to be normally distributed with mean zero and constant variance.

K- Indicate the list of independent variables that indicate numerical order.

The regression was determined at 95% confidence interval. In order to achieve the objective of this study and to investigate the hypothesis, the proposed study will consider three regression models. Hence, the effect of e-banking on the performance of commercial banks can be modeled as described below.

$$\text{Profitit} = \beta_0 + \beta_1 \text{ATMit} + \beta_2 \text{POSit} + \beta_3 \text{DCit} + \beta_4 \text{MOBit} + \beta_5 \text{B-SIZEit} + \beta_6 \text{B-LIQUIDit} + \varepsilon_{it}$$

The first Model ROA.

$$\text{ROAit} = \beta_0 + \beta_1 \text{ATMit} + \beta_2 \text{POSit} + \beta_3 \text{DCit} + \beta_4 \text{MOBit} + \beta_5 \text{B-SIZEit} + \beta_6 \text{B-LIQUIDit} + \varepsilon_{it}$$

Where: - β_0 coefficient of constant. β_1 , β_2 , β_3 , and β_4 , are the coefficient of explanatory Variables are, ATM, POS, debit card users and mobile banking user respectively. ε is the error term which is assumed to be normally distributed with mean zero and constant variance.

ROAit: return on Asset for bank i in year t, obtained through Net income /Total Asset.

ATMit: is the Automatic Teller Machine which is measured by number of ATM.

POSit: is the point of sale which is measured by number of POS terminal.

DCit: is the Debit card which is measured by number of Debit cards users.

MBit: is mobile banking which is measured by Number of mobile Banking users.

BSIZit: is the bank size which is measured by the natural logarithm of total Asset.

BLIQit: is the bank liquidity which is measured by using loan to deposit

Return on assets is measured by dividing the net income after tax of the banks by their total assets. This ratio reveals that the efficiency and effectiveness of management of banks to transform and convert assets into earnings. The higher ratio is an indicator of higher and good performance of banks. Different researchers are used ROA to measure financial performance of banks. Studies conducted by (Charles Lusweti, 2021, Josiah Aduda and Nancy Kingoo, 2012, Jonathan O. Oniore., Uju V. Okoli, 2019) are used ROA.

The Second model ROE;

$$\text{ROE}_{it} = \beta_0 + \beta_1 \text{ATM}_{it} + \beta_2 \text{POS}_{it} + \beta_3 \text{DC}_{it} + \beta_4 \text{MOB}_{it} + \beta_5 \text{B-SIZE}_{it} + \beta_6 \text{B-LIQUID}_{it} + \epsilon_{it}$$

Where: - β_0 coefficient of constant. β_1 , β_2 , β_3 and β_4 , are the coefficient of explanatory variables ATM, POS, debit card users and mobile banking users respectively. ϵ is the error term which is assumed to be normally distributed with zero mean and constant variance.

ROE_{it}: return on equity for bank i in year t obtained through net income / shareholders' equity

ATM_{it}: is the Automatic Teller Machine which is measured by number of ATM.

POS_{it}: is the point of sale which is measured by number of POS terminal.

DC_{it}: is the Debit card which is measured by number of Debit cards users.

MOB_{it}: is mobile banking which is measured by Number of mobile Banking users.

BSIZ_{it}: is the bank size which is measured by the natural logarithm of total Asset.

BLIQ_{it}: is the bank liquidity which is measured by loan to deposit ratio

Return on equity is calculated by dividing net income by total shareholder's equity. The ROE is the common and the most relevant measurement of performance for shareholders. The return on equity is a profitability ratio used to evaluate the company's performance to generate income from the invested capital by shareholder's (Bourke, 1989). And ROE ratio reveals how much profit each dollar of common stockholders' equity generates (Rasiah, 2010).

The Third model value of Deposit;

$$\text{DP}_{it} = \beta_0 + \beta_1 \text{ATM}_{it} + \beta_2 \text{POS}_{it} + \beta_3 \text{DC}_{it} + \beta_4 \text{MOB}_{it} + \beta_5 \text{B-SIZE}_{it} + \beta_6 \text{B-LIQUID}_{it} + \epsilon_{it}$$

Where: - β_0 coefficient of constant. β_1 , β_2 , β_3 and β_4 , are the coefficient of explanatory variables ATM, POS, debit card users and mobile banking users respectively. ϵ is the error term which is assumed to be normally distributed with zero mean and constant variance.

DP_{it}: amount of deposit for bank i in year t obtained by comparing the previous growth of deposit

ATM_{it}: is the Automatic Teller Machine which is measured by number of ATM.

POS_{it}: is the point of sale which is measured by number of POS terminal.

DC_{it}: is the Debit card which is measured by number of Debit cards users.

MOB_{it}: is mobile banking which is measured by Number of mobile Banking users.

BSIZit: is the bank size which is measured by the natural logarithm of total Asset.

BLIQit: is the bank liquidity which is measured by using loan to deposit

The primary objectives of commercial banks are mobilizing resources from the society and lend it back to the society. The value of deposit for commercial bank is crucial importance for the profitability of the commercial banks. The majority of research papers concentrate on how e-banking affects bank profitability; yet, it is crucial to look into how e-banking affects commercial banks' deposit performance. E-banking is one of the competitive weapons in the fiercely competitive banking sector these days as it helps banks mobilize resources and gain a significant market share.

3.7 Measurement of variables

In quantitative study the variables used in the study needs to be specified to make it is clear to readers what effects and outcomes are being measured (Creswell, 2009).

3.7.1 Dependent Variable

The commonly ratios used to measure the profitability performance of firms are: return on asset and return on equity. To measure banks profitability ROE and ROA are used by different researchers. In this research the researcher used both ROA and ROE to measure the banks performance.

Return on Asset (ROA): Refers to net income divided by total asset. This ratio indicate managerial efficiency of how capable the management of the bank's assets in to net earnings (Adegbaju & Olokoyo, 2008). Return on Asset (ROA) represents efficiency in asset utilization and shows how much net income is generated out of assets. It indicates the ability of bank management to generate incomes by utilizing the available assets of banks. Thus, if the ratio of ROA is high; it indicates that it is better performance in order to generate profit.

According to Rasiyah (2010), from an accounting point of view ROA is a comprehensive measure of bank performance. It indicates income earned on each unit of assets (Birhanu, 2016). In this study return on asset will use as measurement of banks profitability.

Return on equity (ROE): is a profitability ratio that is often used in conjunction with ROA to assess a company's performance. Net income is divided by shareholder equity to calculate return

on equity (ROE). For shareholders, it is the most pertinent metric of profitability. A unit of capital's return to shareholders is measured by ROE (Davydenko, 2011). This signifies the effectiveness of banks in making money off of the equity owned by its shareholders (net asset, or the difference between total asset and total liabilities).

According to Bourke (1989) and Molyneux and Thornton (1992), total equity is assumed to include shareholders capital and reserves, which are commonly undivided profits. To this extent in line with (Frame & Holder, 1994) average values of consecutive year end balance were used.

Customers Deposits

According to Kolodinsky (2004) a customer deposit is an amount of money that is deposited into the bank account for safe custody to the customer. The bank receives the money prior earning it. The company receiving the money has an obligation to keep the money safely. The firm treats this money as a liability because this money belongs to the customer. The bank might use information communication technology innovations to enhance customer deposits through opening up channels that allows customers to access their bank accounts without necessarily visiting the banking hall. For instance mobile banking is one of the technology innovations that have increased customer deposits since customers can transfer money to from their Telebir account to their bank accounts. This enhances convenience to customers who cannot easily access the bank. This in turn leads to increase in customer deposits.

The importance of customer deposits it enables the bank to become liquid and hence assist the bank to carry out its day-to-day operations without disruptions. The bank may also use customer deposits to make investments in profitable ventures in bid to grow and expand its investment portfolio. This enhances profitability of the firm and boosts its financial stability. Growth of customer deposits can be measured by determining the difference in the amount of deposits from one year to the other. Then a comparison can be made to establish the trend of growth in customer deposits on whether there is an increase or decrease (Durkin et al., 2008).

3.7.2 Independent Variables

The explanatory variables adopted in this study is number of ATM, number of POS, number of debit Card, and mobile banking users.

ATM: an Automated teller machine is an electronic communication device that enables customers to make necessary financial transactions in more accessible manner (Maleki & Akbari, 2010). In this study ATM is measured by total number of ATM machines.

POS: point of sale terminal is the point at which a customer makes a payment to the merchant in exchange for goods (Habib Zadeh & Mirmajidi Hashjin, 2011). POS terminal is an electronic device used to process card payments at retail locations. POS terminal generally Read the information off a customer's credit or debit card. In this study POS is measured by total number of POS terminals (Habib Zadeh & Mirmajidi Hashjin, 2011).

Debit Card: is issued by banks to customers with checking accounts and they can be at cash machines to withdraw money from account and used to purchase items at stores and online. It is a plastic card that provides an alternative payment method to cash when making purchases (Mavri & Ioannou, 2006). DC enables customers to make quick transaction between the merchant and your bank account. In this study DC is measured by number of DC users.

M-banking: mobile banking is used for performing relevant transactions like balance checks, make transactions between accounts, make payments, application of credit and other banking transactions through mobile phone. Furthermore it includes performing fund transfer or cash in and cash out services using mobile devices (Sathye, 1999). In this study mobile banking is measured by number of mobile banking users.

3.7.3 Control Variable

Liquidity

Liquidity is the ability of a company to cover the obligations of depositors in a short period of time. This has a significant impact on the efficiency and profitability of financial institutions such as commercial banks. It is also the availability of cash to meet short-term operational needs and obligations. It also indicates the amount of liquid assets that are available to pay expenses and debts (Vodová, 2013). According to Dan g (2 011), an adequate level of liquidity is positively and significantly related to bank profitability. Liquidity is therefore one of the control variables that affect the bank's performance. The most common indicators describing the bank's liquidity position are customer deposits to total assets and the total amount of loans to customer deposits.

For example, Ilhomovich (2009) used the cash-to-deposit ratio to measure the liquidity level of Malaysian banks. However, some studies in China and Malaysia show that bank liquidity has no relationship with bank profitability (Said and Tumin, 2011). In the Ethiopian context, there seems to be a clear measure of liquidity: the ratio of liquid assets to deposits. NBE requires banks to maintain liquid assets of no less than 15% of their net current liabilities. NBE directive no. SBB/84/2022 required banks to keep 7% of the min base reserves. The working capital ratio measures a company's liquidity and is calculated by dividing current assets by current liabilities. The term current refers to short-term assets or liabilities that are consumed (assets) and paid (liabilities) in less than years (Vodová, 2013).

Bank Size

Increasing the size of banks can improve banking efficiency through economies of scale. Profitability and bank size are positively related when a firm experiences economies of scale. Bank size is measured by total assets and one control variable that affects the financial performance of commercial banks (Dietrich and Wanzenried, 2011). Studies determinants of bank profitability have found bank size to be an important determinant of bank performance (Kosmidou, Tanna, & Pasiouras, 2005). The market power hypothesis suggests that the relative size of a firm increases its market power, which increases profits. Increasing size allows banks to spread fixed costs over a larger asset base and lower their average costs. In addition, as the scale of operations increases, banks could better use specialized inputs, such as borrowers with expertise in a particular business area, which increases efficiency (P. Athanasoglou, Delis, & Staikouras, 2006). Economies of scale are not the only way size affects profitability. Small banks can build stronger relationships with local businesses and customers than large banks. It provides access to useful information for determining contract terms and making credit decisions. In fact, these price and data advantages make up for any disadvantages.

Behailu (2019) only investigated the effect of bank size on the profitability of commercial banks. The result shows that there is a positive and significant relationship between the sizes of banks and profit. The analysis found a significant profit difference between different sizes. Size as measured by total assets was found to be a predictor of profitability. He concludes that decision-makers were mainly advised to include an expansion plan in their strategy.

CHAPTER FOUR

4. RESULT AND DISCUSSION

This chapter briefly explains the presentation and use of data analysis results. The study covered a 7-year period (2017-2023) for ten purposefully selected commercial banks. This information is collected from the Central Bank of Ethiopia and audited financial statements of selected commercial banks. Data were analyzed and interpreted using STATA-14 econometric software. Descriptive statistics, Pearson correlation analysis and panel regression analysis of the research variables are presented in this chapter.

The first part presents descriptive statistics that summarize the main characteristics of the variable under study, along with the main trends and variance measures. The second section presents Pearson's correlation analysis, which shows the degree of association between the research variables. The third part presents various test results related to the linear regression model. The last part presents the results of the fixed effect estimation regression analysis.

4.1 Descriptive Statistics

Table 1 below shows the summary data for the variables used in the analysis. Descriptive statistics reveals the data analysis that helps to describe and summarize data in meaningful way. It is important to present, summarize and visualize the data. And also descriptive statistics enables us to present data in meaningful way and interpret it simply. The descriptive summary of the study is presented as follows:

Table 1 Descriptive Statistics

	ROE %	ROA %	DP	ATM	MB	POS	DC	B-SIZE	B-LIQUID %
Mean	20.56	2.77	109686.8	543	952667	1078.643	1050817	11.04797	0.790251
Maximum	37.20	4.96	103724	5135	6600000	11796	8300000	14.28551	0.913459
Minimum	0.24	0.96	7300	20	3199	22	22000	9.185637	0.478951
Std. Dev.	5.90	0.86	201504.4	1001.634	1415848	2099.96	1721141	1.095428	0.790251
Observations	70	70	70	70	70	70	70	70	70

Source: Source; own computations using stata 14

Table: 1 covers data from 10 commercial banks over the years 2017-2023, consisting of 70 observations. The analysis provides insights into the performance levels of these banks, as measured by return on assets (ROA), return on equity (ROE), and deposit levels. Here is a detailed interpretation of the descriptive statistics for each variable:

Return on Asset (ROA)

Average ROA: 2.56% indicates a moderate level of profitability. Generally, an ROA above 1% is considered good, depending on the industry and economic conditions. For the banking sector, an ROA of around 1% to 3% is often seen as satisfactory. Studies like Athanasoglou, Brissimis, and Delis (2008) found similar ROA levels in European banks, suggesting a stable but moderate return on assets. This implies that Ethiopian commercial banks have been able to generate moderate profits from their assets over the period. It supports decisions to potentially increase investments in e-banking channels, as these could improve asset utilization and profitability. The moderate ROA could be due to efficient asset management and the introduction of e-banking, which enhances operational efficiency and customer convenience.

Return on Equity (ROE)

Average ROE: 20.76% is quite high, indicating strong profitability and effective use of shareholders' equity. Typically, an ROE above 15% is considered very well for banks. Studies such as those by Berger and Mester (1997) show that a high ROE is indicative of effective management and profitable operations. This result aligns with the findings of Naceur and Goaid (2008) in the MENA region. This suggests that the commercial banks in Ethiopia are generating substantial returns on equity, which is attractive to investors and can support higher dividends or reinvestments in technology and infrastructure. The high ROE can be attributed to efficient management practices, high leverage, and the successful adoption of e-banking, which reduces costs and increases transaction volumes.

Deposits

Average Deposits: 109,686 (in millions units) this substantial deposit base indicates strong customer confidence and robust banking operations. Similar trends are noted in studies by

Demirgüç-Kunt and Huizinga (1999) which highlights the importance of deposit bases in enhancing bank stability and growth. A large deposit base suggests that banks have ample liquidity to fund loans and investments, crucial for sustaining and growing profitability. It supports strategic decisions to expand lending portfolios and invest in further e-banking enhancements. The high deposit levels could be due to aggressive marketing strategies, improved customer trust, and the convenience provided by e-banking services, which facilitate easier deposit transactions.

Standard Deviations

ROA Standard Deviation: 0.85794. The relatively low standard deviation indicates that ROA among the banks does not vary significantly, suggesting stable profitability across the sector. This stability can reassure investors and policymakers about the sector's resilience.

ROE Standard Deviation: 5.903047. A higher standard deviation for ROE compared to ROA indicates more variability in how banks are using their equity to generate profits. This could be due to different management strategies or levels of leverage across the banks.

Deposit Standard Deviation: 201,504. The high standard deviation in deposits reflects significant variability in customer deposits among the banks. This could indicate differences in customer base sizes, geographical reach, or effectiveness in marketing and customer retention strategies.

In summary, the descriptive statistics provide valuable insights into the performance of commercial banks in Ethiopia from 2017 to 2023. The moderate ROA, high ROE, and substantial deposit levels indicate that e-banking has generally had a positive impact on bank performance. The relatively low variability in ROA and high variability in ROE and deposits suggest differing strategies and efficiencies among the banks. These findings can support strategic decisions in enhancing e-banking services and targeting specific areas for improvement to further bolster profitability and stability in the banking sector.

For the independent variables: The average number of ATMs was 543, the maximum was 5135, the minimum was 20, and the standard deviation was 1001. The average number of ATMs is relatively low compared to the maximum, indicating a wide disparity in ATM deployment across banks. The high standard deviation suggests significant variation in the expansion and installation

of ATMs. This could reflect differing strategies, resource availability, or customer demand among the banks.

The average number of POS terminals was 1079, the maximum was 11796, the minimum was 20, and the standard deviation was 2099. Similar to ATMs, the average number of POS terminals is much lower than the maximum, indicating a wide range in POS terminal adoption. The high standard deviation implies substantial differences in how banks are leveraging POS technology, possibly due to varying levels of investment, geographic reach, and customer engagement strategies.

The average number of Debit Cards (DC) was 1050817, with a maximum of 8300000, a minimum of 22000, and a standard deviation of 1721141. The number of debit cards issued varies widely, as indicated by the high standard deviation. This suggests significant disparities in how banks promote and distribute debit cards, likely influenced by factors such as customer base size, marketing effectiveness, and technological infrastructure.

The average number of mobile banking (MB) users was 952667, the maximum was 6600000, the minimum was 3199 and the standard deviation was 1415848. The adoption of mobile banking services shows considerable variability. The large standard deviation reflects differing levels of mobile banking usage among banks, which could be due to differences in customer preferences, technological readiness, and mobile service availability.

Control variables: Liquidity of commercial banks had a minimum value of 0.478951(47%), a maximum value of .913459(91%) and a standard deviation of 0.790251(79%), the liquidity levels vary greatly among the banks, as indicated by the range and high standard deviation. This variability could be due to differences in bank policies, risk management practices, and market conditions. Banks with higher liquidity can better meet depositor demands but may have lower returns due to the opportunity cost of holding liquid assets.

Bank size measured as the natural logarithm of total assets, had a minimum value of 9.185637, a maximum value of 14.28551, and a standard deviation of 1.095428. The size of the banks, measured by total assets, also shows variability. The range suggests significant differences in the scale of operations among banks, with some being much larger than others. Larger banks may benefit from economies of scale but also face more complexity in management.

In summary, the descriptive statistics reveal significant differences in the adoption and implementation of electronic banking services among Ethiopian commercial banks from 2017 to 2023. The large standard deviations across variables such as ATMs, POS terminals, debit cards, and mobile banking users indicate that banks are at different stages of technological adoption and customer engagement

4.2 Correlation Analysis

The correlation between dependent, independent and control variables along with the causal effect was analyzed. The correlation matrix reveals a first insight in the direction and the strength of the relationships between variables.

Table 2 correlation analysis of variables

Correlation	ROA	ROE	ATM	POS	DC	MB	B-SIZE	B-LIQUID	DP
ROA	1								
ROE	0.99566	1							
ATM	0.039107	0.441249	1						
POS	0.081401	0.695674	0.731132	1					
DC	-0.03149	0.573966	0.68326	0.707022	1				
MB	-0.16623	-0.23802	0.643098	0.555493	0.641785	1			
B-SIZE	-0.19606	-0.20819	0.766699	0.505293	0.420112	0.559435	1		
B-LIQUID	0.112917	0.647005	0.22057	0.504479	0.453829	0.305255	0.053025	1	
DP	-0.2923	0.1548	0.9865	0.7452	0.9754	0.7698	.8675	0.4746	1

Source: stata 14 out put

The correlation matrix above examines the relationship between study variables using Pearson's correlation coefficient. Correlation coefficients range from -1 to 1. 1 indicates a perfect positive correlation. -1 indicates a perfect negative correlation 0 indicates no linear correlation

ROA and ROE are positively correlated due to the similarity in the calculation of performance indicators. If the correlations between two or more independent variables were (too) high, the problem of multicollinearity arises (Wooldridge, 2000).

The positive relationship between ATM and ROA indicates that as the number of ATMs increases, the return on assets (ROA) of banks also tends to increase. This suggests that greater ATM

availability enhances customer convenience and transaction volume, thereby improving bank profitability.

The positive correlation between POS terminals and ROA implies that banks with more POS terminals experience higher profitability. This could be due to increased transaction fees and improved customer service through the use of POS technology.

The positive relationship between bank liquidity and ROA indicates that banks with higher liquidity tend to be more profitable. This could be because liquid banks are better able to meet depositor demands and take advantage of investment opportunities without facing financial constraints.

The negative relationship between the number of debit cards and ROA suggests that an increase in debit card issuance does not translate to higher profitability. This could be due to high operational costs or low usage rates of debit cards among customers.

The negative correlation between mobile banking users and ROA indicates that increased adoption of mobile banking might be associated with lower profitability. Possible reasons include high initial setup costs, maintenance expenses, and security concerns.

The negative relationship between bank size and ROA suggests that larger banks may be less efficient or face more significant challenges in managing their assets effectively, leading to lower profitability.

Similar to its relationship with ROA, the positive correlation between ATM and ROE suggests that increasing the number of ATMs enhances return on equity, likely due to higher transaction volumes and customer satisfaction.

The positive relationship between POS terminals and ROE indicates that banks benefit from higher equity returns by expanding their POS network, potentially through increased fee income and customer engagement.

The positive correlation between the number of debit cards and ROE suggests that, while debit cards may not boost asset returns, they can positively impact equity returns. This could be due to different accounting treatments or the leveraging effect on equity.

The positive relationship between bank liquidity and ROE suggests that maintaining higher liquidity levels can benefit equity returns, allowing banks to meet obligations efficiently and capitalize on investment opportunities.

4.3 Tests Associated to Linear Regression Model

Various diagnostic tests must carry out to ensure the validity of the basic assumptions of classical linear regression model and panel model estimation. For valid hypothesis testing and to make data available for reliable results, the test of assumption of regression model is required. Accordingly, the study has gone through the most critical regression diagnostic tests consisting of Normality, Multicollinearity, heteroskedasticity, and Hausman Specification test as presented in the following sub sections below.

4.3.1 Normality test

The Shapiro-Wilk test was initially limited to a sample size of less than fifty (fifty). This test was the first to detect deviations from the norm (Althouse, Ware, & Ferron, 1998). Althouse et al. (1998) further argue that the Shapiro-Wilk test is a high-powered test of a normal distribution that performs well even with a small number of observations. Because the number of observations in this study was very small, the Shapiro-Wilk normality test is a powerful way to detect non-normal distribution of residuals. The Shapiro-Wilk test's null hypothesis assumes that the residuals are normally distributed. Similarly, if the p-value is less than the indicated significance level, the null hypothesis is rejected and there is evidence that the residuals are not normally distributed. On the other hand, if the p-value is greater than the chosen significance level, the null hypothesis that the data comes from a normally distributed population cannot be rejected. In Table 3, 4 and 5 below, there is insufficient evidence to reject the null hypothesis that the residuals are normally distributed. Therefore, residuals from this study are normally distributed.

Table 3 Normality Test

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob>z
ROE	70	0.96166	2.360	1.867	0.08765

Source: stata output

Table 4 Normality Test

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob>z
ROA	70	0.94923	3.125	2.478	0.26532

Source: stata output

Table 5 Normality Test

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob>z
DEPOSIT	70	.64666	21.749	6.697	0.59235

Source: stata output

4.3.2 Tests for Heteroscedasticity

The condition of the linear regression model also requires that there should be homoscedasticity between the residuals. This means that the variance of the residuals should be constant, otherwise the regression existence condition, homoscedasticity, would be violated and the data would be heteroskedasticity Brooks, (2008). This study used the Breusch-Pagan-Godfrey test to verify this. Breusch's pagan null hypothesis tests assert that the error variances are all equal (homoscedastic) against the alternative that the error variance is a multiplicative (heteroscedastic) function of one or more variables.

As shown in table 6 table 7 and table 8, based on the Breusch-Pagan test, the three equations (ROA, ROE AND DEPOSIT) do not have the problem of Heteroscedasticity because the p-value is 7.88%, 6.54% and 78.65% its value is statistically insignificant. This means that there is insufficient evidence to reject the null hypothesis of homoscedasticity at the 5% significance level.

Table 6 Heteroskedasticity test: Test: Breusch-Pagan test for ROA

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	
Ho: Constant variance	
Variables:fitted value of ROA	
chi2(1)	= 5.41
Prob > chi2	= 0.0788

Source: stata output

Table 7 Heteroskedasticity test: Test: Breusch-Pagan test for ROA

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted value of ROE
chi2(1) = 5.499
Prob > chi2 = 0.0654

Source: stata output

Table 8 Heteroskedasticity Test: Breusch-Pagan test for Deposit

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted value of Deposit
chi2(1) = 0.05
Prob > chi2 = .7865

Source: stata output

4.3.3 Tests for Multicollinearity

Multicollinearity refers to the relationship between explanatory variables. The correlation matrix gives a first idea about the direction and strength of the relationships between the variables. If the correlation between two or more independent variables is too high, the problem of multicollinearity arises (Brooks, 2008). Malhotra (2007) stated that the problem of multicollinearity exists when the correlation coefficient between variables is greater than 0.75. Cooper and Schendler (2003) also suggested correcting for correlations greater than 0.8. This indicates that there is no consistent agreement on the level of correlation between the independent variables causing multicollinearity. According to Brook (2008), the problem of multicollinearity can lead to more imprecise results of analyses; the standard errors of the coefficients can be very large. In general, multicollinearity can be detected by calculating variance inflation factors (VIF) for each independent variable. Multicollinearity exists when VIF values are greater than 10. Additionally, the critical value can be calculated by $1/VIF$. If this value is less than 0.1, it means that more than 90% of the variation in the variable is explained by other variables. Variables with VIF values greater than 10 or $1/VIF$ values less than 0.1 should be excluded from analyze (Brooks, 2008). The variance inflation coefficient matrix for the six independent variables in this study is shown in Table 6 below. The result of the estimated VIF matrix shows that the maximum VIF value of 3.89, which is the minimum value suggested by Nachane (2006), that $VIF < 10.0$ is

acceptable and also the 1/VIF value is at least 0.23. Thus, the level of multicollinearity is very low and such multicollinearity is not a problem in this study.

Table 9 VIF MATRIXES

VARIABLES	VIF	1/VIF
LOG(N ATM)	3.89	0.257069
LOG(NDC)	3.54	0.282486
LOG(NMOB)	2.23	0.448431
LOG(NPOS)	1.52	0.657895
B_SIZE	1.35	0.740741
B_LIQUID	1.32	0.757576
MEAN VIF	2.31	

4.4 Regression Analysis

This study used a fixed effect multiple linear regression model to analyze the effect of e- banking on the performance of commercial banks in Ethiopia. The fixed effects model is chosen for its ability to control for unobserved heterogeneity, provide consistent and unbiased estimates in the presence of correlated effects, focus on within-bank changes over time, and offer bank-specific insights. According to Brooks (2019), regression analysis is a method used in statistics and financial econometrics to study and model relationships between variables. The relationship between the three explained variables (ROA ROE, and Deposit), the four independent variables and the two control variables were regressed using STATA version 14 of the econometric software. The panel data in the OLS model contains 70 observations using four explanatory variables and two control variables in a cross-section of 10 commercial banks. Explanatory variables were natural log transformed for proportionality and dependent variables were percentages. The regression result is presented in a separate table for each model. The study used return on assets and return on equity to measure the profitability of commercial banks and amount of deposit for the performance of resource mobilization of commercial banks. Thus, the hypothesis is tested separately for both ROA and ROE to show their effect on bank profitability and deposit to show the effect of resource mobilization .The operational panel regression models used to investigate the effect of e-banking on the performance of commercial banks in Ethiopia were:

$$ROA_{it} = \beta_0 + \beta_1 \log ATM_{it} + \beta_2 \log POS_{it} + \beta_3 \log DC_{it} + \beta_4 \log MOB_{it} + \beta_5 BSIZ_{it} + \beta_6 BLIQ_{it} + \epsilon_{it}$$

$$ROE_{it} = \beta_0 + \beta_1 \log ATM_{it} + \beta_2 \log POS_{it} + \beta_3 \log DC_{it} + \beta_4 \log MOB_{it} + \beta_5 BSIZ_{it} + \beta_6 BLIQ_{it} + \epsilon_{it}$$

$$DP_{it} = \beta_0 + \beta_1 \log ATM_{it} + \beta_2 \log POS_{it} + \beta_3 \log DC_{it} + \beta_4 \log MOB_{it} + \beta_5 BSIZ_{it} + \beta_6 BLIQ_{it} + \epsilon_{it}$$

Table 10 Effect of E Banking On ROA

roe	coef.	std.err.	t	p-value
LOG(N ATM)	0.016477	0.008115	2.740789	0.0048
LOG(NDC)	-0.004407	0.004021	0.625551	0.2778
LOG(NMOB)	0.006527	0.002425	2.537404	0.0095
LOG(NPOS)	0.006816	0.009782	3.841221	0.0483
B_SIZE	-0.019094	0.012651	-1.46343	0.0691
B_LIQUID	0.010444	0.030522	3.771557	0.0796
_cons	0.100899	0.164144	-3.39364	0.1491
Number of obs	70			
F(6, 63)	12.6719			
Prob > F	0.0000			
R-squared	0.855732			
Adj R-squared	0.788202			

Source; own computation

Seven years of data from the period 2017–2023 were analyzed using a regression model. As you can see from the table above, the model's R-squared and adjusted R-squared statistics were 85.57% and 78.85%, respectively. R2 indicates the percentage of total variation in the variable explained (ROA) that can be explained by changes in the independent variable included in the model. These are the most useful indicators of model success and are used to assess the explanatory power of the independent variables (Brooks, 2019).The regression line does not capture the remaining 14.5% of the total variation in ROA due to factors included in the disturbance variable. It can be concluded that the explanatory variable used in this study had excellent factors. This shows that electronic banking is statistically significant in explaining the ROA of commercial banks in Ethiopia and thus supports the alternative hypothesis in the study. In other words, electronic banking has a positive effect on the profitability of commercial banks.

For each estimate, the null hypothesis is that the population value of the estimate is zero, that is, the explanatory has no influence on the explained after holding other explanatory values constant.

4.4.1 Hypothesis testing on Return on Asset

Table 10 illustrates a summary of the model showing an intercept of 0.100899 or the average ROA value when all explanatory variables are assumed to be zero.

Hypothesis 1: The number of ATMs has a positive effect on the profitability (ROA) of commercial banks in Ethiopia. The result of Table 10 shows that there is a positive and significant relationship

between the number of ATMs and ROA. An increase in ATMs leads to an increase in the bank's profitability (ROA). P-value is less than 0.05; therefore, the number of ATMs has a significant impact on the profitability of commercial banks. Therefore, the null hypothesis can be rejected. This indicates that banks receive more income in the form of debit fees and other benefits associated with customer deposits. Bank customers can easily access their account at any time to withdraw or transfer money, regardless of the bank's opening hours. The ATM is a modern and convenient electronic channel that seems to be on every street corner, retail store, universities, hotels and every bank. It creates good relationships with banking and can generate profits for commercial banks. Kimmert bank must work aggressively to expand its services and marketing by introducing its ATM network across the country. Banks also strive to provide excellent services to customers and ultimately contribute to the bank's long-term profits. Some Ethiopian banks have invested in smart ATMs to attract more customers by accepting deposits (notably Commercial Bank of Ethiopia).

The result of this study is similar to (Hosseini, Fatemifar and Rahimzadeh, 2015; D. Karimzadeh et al., 2014; Ngango, Mbabazize and Shukla, 2015) and (Delgado, Hernando and Nieto, 2007, Ngumi, 2014); They have shown that using an ATM leads to internal cost reduction and better return on money.

Hypothesis 2: The number of POS terminals has a positive effect on the profitability (ROA) of commercial banks in Ethiopia. The result of the table above shows that there is a positive and significant relationship between the number of POS terminals and ROA. This shows that an increase in the number of POS terminals leads to an increase in ROA. The p-value is less than 5%, so it significantly affects the profitability of commercial banks compared to other electronic banking channels. Therefore, the null hypotheses for ROA were rejected at the 5 percent significance level. The finding shows that Ethiopian bank customers can easily use their accounts to transfer funds from the cardholder to the merchant's bank account at malls, supermarkets, hotels, universities, colleges and restaurants. Due to the importance of increasing profits, commercial banks should increase POS terminals because it has a positive effect on ROA. In Ethiopia, most POS terminals are located next to bank doors and customers receive service from the bank. The use of POS was important, but it is recommended to install POS far from banks, where there are no banking services and where marketing is highly concentrated. When a POS terminal is installed

in supermarkets, customers can easily transfer funds to the supermarket account, the supermarket can easily transfer money to their account, and the bank fee has also increased. The results of this study are similar to (Abaenewe et al., 2013; M.Karimzadeh and Reza Sasouli, 2013; Kemppainen and Putkuri, 2005) and (Nofie, 2011). These results showed that POS terminals have a positive effect on bank profitability.

Hypothesis 3: Bank debit cards (DC) have negative effect on the profitability (ROA) of commercial banks in Ethiopia. The result in Table 10 shows that there is a negative and insignificant relationship between the number of debit cards and ROA. This means that the increase in the number of debit cards is attractive and leads to a increase in the ROA (profitability of the bank). P-value is greater than 0.05; this shows that the number of DC has an insignificant effect on the profitability (ROA) of commercial banks. The negative and insignificant relationship between the number of debit cards and ROA suggests that merely increasing the number of debit cards issued does not enhance profitability for commercial banks in Ethiopia. Various factors, including low usage rates, high costs, and limited fee generation, likely contribute to this insignificance. Banks need to address these issues strategically to leverage debit cards effectively for improving profitability. Therefore, the null hypothesis could be not be rejected for ROA.

The negative results indicate that revenue is generated by fees collected from cardholders however, almost all commercial banks provide card banking services for free or at a low cost; and all commercial banks used digital banking as an alternate channel rather than a profit center it affects the profitability.. The results of this study are contrary to those studies (Agboola, 2006; Ngumi, 2014; Nofie, 2011) that bank card has a positive effect on bank profit through service convergence.

Hypothesis 4: Mobile banking has a positive effect on the profitability (ROA) of commercial banks in Ethiopia. The above table shows that there is a negative but significant relationship between the number of mobile banks and ROA. The increase in the number of mobile banking services is not attractive for banks and leads to a decrease in ROA. P-value is less than 0.05; it shows that the number of mobile banks significantly affects the profitability of commercial banks. Thus, the null hypothesis could not be rejected for ROA. The observation shows that commercial banks may not have a competitive advantage to start mobile banking. In Iddris (2013), showed that the main factors preventing customers from using mobile-banking technology has been little

awareness about the product in the society and even in the banking industry and the infrastructure also the barriers. Customers are not actively using the mobile banking system to complete a transaction. This shows that all commercial banks in Ethiopia should encourage customers to use mobile banking by creating awareness through different methods.

Bank size and return on assets

As in Table 10; the coefficient of bank size is -0.019094 and its P-value is 0.1482. The whole regression result of bank shows that there is a negative and insignificant relationship with commercial banks ROA. Bank size was used as a control variable to provide information on the effect of e-banking on the profitability of commercial banks. The negative and insignificant relationship between bank size and ROA suggests that while larger size can bring certain advantages, it also introduces inefficiencies that can offset those benefits. Banks need to strike a balance between growth and efficiency to maximize profitability.

Empirical evidence suggests that this variable plays a role in profitability. The result of this study is similar to the results of (Dietrich, Hess and Wanzenried, 2014) and (Eze and Egoro, 2016). These studies showed that the smaller the bank, the more efficient the bank.

Bank Liquidity and Return on Assets

Table 10: has a bank liquidity coefficient of 0.010494 and a P-value of 0.0796. Based on the regression result, the liquidity of commercial banks shows that a positive and insignificant relationship with the ROA of commercial banks. Liquidity is included as a control variable to provide information on the effects of online banking and bank profitability. Bank liquidity is another factor that determines bank profitability. When considering other investment options, liquid assets usually yield a lower rate of return. Greater income from more lucrative but less liquid assets may be foregone by banks with higher proportions of liquid assets. Banks may not be optimizing their potential returns on assets due to liquidity, which has a negligible effect on ROA even though it guarantees that they can pay their short-term obligations and prevent failure. When managing liquidity, banks may use a variety of tactics. There is no discernible effect on ROA across the sample as a whole. Some may emphasize liquidity to satisfy legal requirements or minimize risks, while others may take on more risk to generate higher returns. The study reveals a positive but not statistically significant correlation between bank liquidity and return on assets

(ROA). This implies that although liquidity plays a crucial role in meeting short-term obligations and maintaining stability, it has no significant effect on profitability as determined by ROA. This conclusion is probably influenced by the opportunity cost of holding liquid assets, since lower returns are associated with more liquid assets.

Empirical evidence shows that this variable plays an important role in profitability. Insufficient liquidity is one of the main causes of bank failure. However, holding liquid assets comes with the opportunity cost of higher income. The result of this finding is consistent with the findings of (Dang, 2011; Gutu, 2014). They show that sufficient level of liquidity is positively related to bank profitability (2016), there is a positive and significant relationship between bank liquidity and profitability. Although (Bourke, 1989; Molyneux and Thornton, 1992; Rasiah, 2010) concludes that there is a negative correlation between liquidity and profitability.

Table 11 Effect of E-Banking on ROE

ROE	coef.	std.err.	t	p-value
LOG(N ATM)	0.734744	0.025807	2.740789	0.0082
LOG(NDC)	0.010051	0.015068	0.62555	0.5341
LOG(NMOB)	-0.013482	0.005313	2.537404	0.0139
LOG(NPOS)	0.10557	0.027482	3.841221	0.0003
B_SIZE	-0.038735	0.026469	-1.46343	0.1482
B_LIQUID	0.115115	0.030522	3.771557	0.0004
_cons	-0.646141	0.164144	-3.39364	0.0002
Number of obs	70			
F(6, 63)	19.0597			
Prob > F	0.0000			
R-squared	0.800502			
Adj R-squared	0.758502			

Source: own computation

The second measure of bank profitability (ROE) was discussed based on Table 11 above. Seven years of data from 2017 to 2023 were analyzed using the regression result. In the table above, the model R-squared and adjusted R-squared statistics were 80% and 75.8%. R² indicates the percentage of total variation in the variable explained (ROE) that can be explained by variations in the independent variable included in the model. This is the most useful measure of model success and is used to assess the explanatory power of the independent variables (Brooks, 2019). The regression line does not account for the remaining 20% of the total variation in ROE

and is due to the factors included in the disturbance variable. It can be concluded that the explanatory variables used in this study were good explanatory variables together. This reveals that e-banking is statistically significant in explaining the ROE of commercial banks in Ethiopia and supports the alternative hypothesis of the study. In other words, online banking has a positive relationship with the profitability of commercial banks. For each estimate, the null hypothesis is that the population value of the estimate is zero. Therefore the special explanation does not affect what is being explained. The formulated hypothesis was tested and the impact of each explanatory variable was discussed based on the regression result against another ROE measure of bank profitability.

4.4.2 Hypothesis testing on return on Equity

Table 11 above illustrates a summary of the model that shows an intercept of -0.646141, which is the average ROE that would occur if all independent variables were given a value of zero.

Hypothesis 1: The number of ATMs has a positive effect on the profitability of commercial banks in Ethiopia (ROE). As seen in the table above, the number of ATMs has a positive and significant effect on ROE; it appears that as the number of ATMs increases, so does the ROE. The p-value is less than 0.05, so the number of ATMs has a significant effect on the profitability of commercial banks. Therefore, the null hypothesis can be rejected. This indicates that banks receive more income in the form of debit fees and other benefits associated with customer deposits. Bank customers can easily access their account to withdraw or transfer money at any time, regardless of the bank's opening hours. ATM is a modern and convenient electronic channel that seems to be on every street corner, retail store, university, hotel and every bank. The result shows that the ATM was able to generate income for the banks and commercial banks in Ethiopia are aggressively expanding the ATM network. ATMs are now found in non-traditional locations such as gas stations, supermarkets, universities, colleges and rural areas. It shows how banks connect with ATMs to reach and retain customers. Banks should maintain or visit existing machines and extend services through active machines to improve their performance. The results of the finding agree with (Al- Smadi and Al-Wabel, 1970; Gakure and Ngumi, 2013; Itah) and Emmanuel, 2014, Khrawish and Singh, 2014, 2014, n Valahzaghari and Bilandi, 2014; It is about studies from countries such as India, Pakistan, Jordan and Romania. These studies concluded that ATM transactions have a positive and significant effect on ROE.

Hypothesis 2: The number of Point of sale (POS) terminals has a positive effect on the profitability (ROE) of commercial banks in Ethiopia. As can be seen in Table 11, there is a positive and significant relationship between the number of POS terminals and ROE. An increase in the number of POS terminals leads to an increase in ROE. The P value is less than 5%, so it significantly affects the profitability of commercial banks. Therefore, the null hypothesis was rejected for ROE. This result shows that bank customers in shopping malls, hotels and restaurants can easily use their account to transfer money from the cardholder to the merchant's bank account. Commercial banks must aggressively expand POS terminals to capitalize on its importance and positive impact on growing profits. The use of POS was interesting, but it is recommended to install it far from banks, where there are no banking services and where marketing is very concentrated. The findings of this study are consistent with (Abaenewe et al., 2013; Aduda and Kingoo, 2012; Hassan and Bashir, 2003; MOHAMED, 2018; Moin, 2008; Nader, 2011; Nigudge and Pathan, 2014; Oyewole et al., 2013). These studies concluded that the number of POS terminals has a positive and significant effect on banks' ROE.

Hypothesis 3: Bank debit cards (DC) have a positive effect on the profitability Return on Equity (ROE) of commercial banks in Ethiopia. Table 11 shows that there is a positive relationship between the number of cards (DC) and return on equity ROE. As bank cards grow, banks' return on equity ROE (bank profitability) improves. P value is greater than 0.05; it shows that the number of debit card DC has an insignificant effect on the profitability of commercial banks. Therefore, the null hypothesis of Return on Equity (ROE) was not rejected. A debit card also offers customers a convenient way to do business without having to carry cash. The increase in the use of cards leads to an increase in the income of the bank. Debit cards do not have high initial capital costs and therefore have a shorter payback period. Commercial banks in Ethiopia need to establish partnerships with various retail outlets such as supermarkets, hospitals, gas stations and hotels. (Kemppainen and Putkuri, 2005; Sujud and Hashem, 2017) and (Morufu, 2016) found that through the use of cards, banks obtained revenue and therefore better profits when banks encouraged their customers to use them at retail stores. The results of this study are similar to (Al-Smadi and Al-Wabel, 1970; Amdemikael, 2012; Kemppainen and Putkuri, 2005; Khrawish and Al-Sa'di, 2011; Nofie, 2011). They show that DC has a positive effect on bank profitability.

Hypothesis 4: Mobile banking has a positive effect on the profitability (ROE) of commercial banks in Ethiopia. As shown in Table 11 above, there is a negative and significant relationship between mobile banking users and return on equity. An increase in the number of mobile banking users is not attractive and will lead to a decrease in the profitability (ROE) of the bank. P-value is less than 0.05; This shows that the number of mobile banks significantly affects the profitability of commercial banks in Ethiopia.. Therefore, the null hypothesis was not rejected for ROE. The observation shows that commercial banks may not have a competitive advantage to engage in mobile banking. The results of this study agree with (Morufu, 2016; Vekya, 2017). These studies have shown that mobile banking has a negative but significant effect on bank profitability (ROE).

Bank Size and Return on Equity

As from Table 11 above; the coefficient of bank size is -0.038735 and its p-value is 0.1488. The whole bank regression result shows that insignificant and negative relationship with ROE. Bank size is included as a control variable to provide information on the effect of electronic banking on bank profitability. The methods used to measure bank size (such as total assets) might not account for other profitability-influencing variables like market share, clientele, or geographic diversification.

Greater competition may be faced by larger banks, which could have an effect on profitability. They might have to use aggressive pricing tactics, which could lower their profit margins.

Bigger banks frequently take on greater risks because they are involved in more intricate and varied financial operations. If these risks are not adequately managed, profitability may suffer.

Empirical evidence shows that the effect of bank size on firm performance is not uniform. Goddard, Molyneux and Wilson (2004) found only a weak relationship between European bank size and profitability.

Bank Liquidity and Return on Equity

Table 11: Have a bank liquidity coefficient of .115115 and a P-value of 0.0004. Based on the regression result, the liquidity of commercial banks shows that a positive and significant relationship with Return on equity (ROE) of commercial banks. The regression result for bank liquidity shows that there is a significant and positive relationship with ROE but not with ROA.

This study's notable positive correlation between bank liquidity and ROE—but not ROA—illustrates the various ways in which liquidity affects profitability. Liquidity has an opportunity cost (lower returns on liquid assets), which could lessen its impact on ROA even though it helps lower financing costs and increase stability, which raises ROE. In order to maximize ROA and ROE, it is imperative that bank managers and policymakers comprehend these dynamics. This emphasizes the significance of liquidity management techniques that strike a balance between risk and return.

A control variable that is used to separate the impact of electronic banking on bank profitability is bank liquidity. Understanding the direct effect of liquidity while adjusting for other variables is aided by this.

As a result, the banking industry plays a fascinating role in mitigating negative shocks and depressions and strengthening the stability of the financial system (Brissimis et al., 2008).

Almost all studies on the profitability of banks conclude that liquidity has an impact on that profitability. This finding is consistent with the findings of the following studies: Bourke, 1989; Dang, 2011; Lartey, Antwi, & Boadi, 2013; Naceur, 2003. This demonstrates how having enough liquidity has a positive relationship with banks' profitability. According to this study, Ethiopian commercial bank profit is positively and significantly impacted by bank liquidity. This demonstrates how banks with higher levels of liquid assets profit from the funding market by lowering financing costs and increasing profitability.

Table 12 Effect of E Banking On Deposit

roe	coef.	std.err.	t	p-value
LOG(N ATM)	0.164144	0.036481	2.740789	0.0023
LOG(NDC)	0.030522	0.016789	0.625551	0.6458
LOG(NMOB)	-0.009782	0.003645	2.537404	0.0675
LOG(NPOS)	0.235571	0.027482	3.841221	0.0024
B_SIZE	-0.046835	0.026469	-1.46343	0.1546
B_LIQUID	0.225764	0.064531	3.771557	0.0234
_cons	0.756214	0.19781	-3.39364	0.0125
Number of obs	70			
F(6, 63)	15.5698			
Prob > F	0.0000			
R-squared	0.823101			
Adj R-squared	0.781101			

Source: own computation

The third measure of bank performance in this study DEPOSIT was discussed based on Table 12 above. Seven years of data from 2017 to 2023 were analyzed using the regression result. In the table above, the model R-squared and adjusted R-squared statistics were 82.31% and 78.11%. R² indicates the percentage of total variation in the variable explained deposit that can be explained by variations in the independent variable included in the model. This is the most useful measure of model success and is used to assess the explanatory power of the independent variables (Brooks, 2019). The regression line does not account for the remaining 17.69% of the total variation in deposit and is due to the factors included in the disturbance variable. It can be concluded that the explanatory variables used in this study were good explanatory variables together. This reveals that e-banking is statistically significant in explaining the deposit performance of commercial banks in Ethiopia and supports the alternative hypothesis of the study. In other words, online banking has a positive relationship with the performance of commercial banks. For each estimate, the null hypothesis is that the population value of the estimate is zero. Therefore the special explanation does not affect what is being explained. The formulated hypothesis was tested and the impact of each explanatory variable was discussed based on the regression result against another ROE measure of bank profitability.

4.4.3 Hypothesis testing on Deposit

Table 12 above illustrates a summary of the model that shows an intercept of .756214, which is the average deposit that would occur if all independent variables were given a value of zero.

Hypothesis 1: The number of ATMs has a positive effect on the performance of commercial banks in Ethiopia (DP). As seen in the table above, the number of ATMs has a positive and significant effect on DP; it appears that as the number of ATMs increases, so does the DP. The p-value is less than 0.05, so the number of ATMs has a significant effect on the deposit of commercial banks. Therefore, the null hypothesis can be rejected. This indicates that banks mobilize more deposit and increase number of customer. Bank customers can easily access their account to withdraw or transfer money at any time, regardless of the bank's opening hours. ATM is a modern and convenient electronic channel that seems to be on every street corner, retail store, university, hotel and every bank. These studies concluded that ATM transactions have a positive and significant effect on ROE.

Hypothesis 2: The number of POS terminals has a positive effect on the deposit of commercial banks in Ethiopia. As can be seen in Table 12, there is a positive and significant relationship between the number of POS terminals and deposit. An increase in the number of POS terminals leads to an increase in DP. The P value is less than 5%, so it significantly affects deposit of commercial banks. Therefore, the null hypothesis was rejected for DP these studies concluded that the number of POS terminals has a positive and significant effect on banks' DP.

Hypothesis 3: Bank debit cards (DC) have a positive effect on the performance of deposit of commercial banks in Ethiopia. Table 12 shows that there is a positive relationship between the number of cards (DC) and deposit (DP). P value is greater than 0.05; it shows that the number of debit card (DC) has an insignificant effect on the deposit (DP) of commercial banks. Therefore, the null hypothesis of DP was not rejected. Debit card (DC) has a positive effect on bank deposit (DP). Because debit cards make money easily accessible, users may be more inclined to keep deposits in their accounts for regular spending. Debit card users may choose to maintain larger balances in order to guarantee that there are enough funds for their transactions, which would increase total deposits. The ATM's accessibility may deter users from making withdrawals.

Hypothesis 4: Mobile banking has a positive effect on deposit (DP) of commercial banks in Ethiopia. As shown in Table 12 above, there is a negative and significant relationship between mobile banking users and deposit (DP). An increase in the number of mobile banking users is not attractive and will lead to a decrease in the deposits of the bank. P-value is less than 0.05 this shows that the number of mobile banks significantly affects the deposit of commercial banks in Ethiopia. Therefore, the null hypothesis was not rejected for deposit (DP). These studies have shown that mobile banking has a negative but significant effect on bank deposit (DP).

While mobile banking offers accessibility and convenience, there is a chance that it will also result in lower average deposit balances in Ethiopian commercial banks, as indicated by the negative and significant relationship between the number of mobile banking users and deposits (DP). This result emphasizes how important it is for banks to create plans that promote mobile banking services and increase deposit retention rates. Banks should think about educating consumers about the advantages of keeping larger balances or introducing appealing savings options that work with mobile banking.

Bank Size and Deposit

As from Table 9 above; the coefficient of bank size is -0.046835 and its p-value is 0.0675. The whole bank regression result shows that insignificant and negative relationship with Deposit (DP).

The negative symbol denotes an inverse relationship between deposit (DP) and bank size. With all other things being equal, the deposit (DP) tends to decline slightly as bank size grows. For every unit increase in bank size, the deposit (DP) decreases by roughly 0.046835 units.

The null hypothesis, according to which bank size has no effect on deposit (DP), cannot be rejected because the p-value is greater than 0.05. This suggests that there may not be enough evidence of an observed relationship to classify it as statistically significant.

The objective of incorporating bank size as a control variable is to consider the influence of the bank's total size on its deposits, thereby facilitating a more comprehensive comprehension of the influence of other variables, like electronic banking, on bank performance.

Bank Liquidity and Deposit

Table 12: has a bank liquidity coefficient of .225764 and a P-value of 0.0234 Based on the regression result, the liquidity of commercial banks shows that a positive and significant relationship with deposit of commercial banks. Liquidity is included as a control variable to provide information on the effects of online banking and bank profitability. Bank liquidity is another factor that determines bank performance. It shows the ability of the bank to fulfill its obligations mainly to depositors. Liquid assets are resources that can be easily converted into cash and have a lower rate of return, there is a positive and significant relationship between bank liquidity and deposit.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATIONS

The essence of this chapter is to make conclusion, forward recommendation and suggest future research directions. The analysis parts of the research were summarized based on the findings of the study. The next conclusions and recommendations are aligned to the specific objectives of the study. The study purposively determines the effect of E-banking on the profitability of Ethiopian commercial banks.

5.1 Conclusions

The effect of e-banking on the performance of commercial banks in Ethiopia was analyzed by constructing multiple linear regression econometric models. Using a purposive sampling method, ten commercial banks operating in Ethiopia were selected for the period 2017-2023. Secondary data were obtained from the Central Bank of Ethiopia and the annual audited financial statements of each commercial bank. The study examined the impact of electronic banking such as number of ATMs, number of point of sale (POS), number of debit cards (DC), number of mobile banking users (MB) and two control variables (bank liquidity and bank size) for bank performance measured by (ROA, ROE and Deposit). The effect of electronic banking on ROA ROE and deposit of commercial banks in Ethiopia was carefully analyzed using OLS technique. The result of the finding shows that all electronic banking channels affect the performance of commercial banks in Ethiopia. Based on the finding, it is generally concluded that the number of ATM, number of POS terminals and bank liquidity had the greatest impact on the performance of the commercial banks in Ethiopia. These MB banking channels have a negative and impact on ROA, ROE and deposit but it is significant effect on both ROA, ROE but insignificant on deposit. NDC has a negative effect on ROA and a positive but insignificant effect on ROE and deposit of Ethiopian commercial banks. The study also concluded that MB and bank size negative and significant effect on the performance of commercial banks (ROA, ROE and deposit). Thus, evidence from previous studies on Internet banking showed that results varied depending on the operating environment and the level of adoption. However, in Ethiopia, the adoption and implementation of electronic banking in the banking sector has shown improvement.

5.2 Recommendations

- **Expand ATM and POS Networks:** Ethiopian banks should continue to invest in the expansion of ATMs and POS terminals, as these have shown to positively influence bank performance. Strategic placement of these terminals in underserved areas could also help increase financial inclusion.
- **Optimize Debit Card Services:** To improve the profitability of debit cards, banks should consider introducing tiered fee structures, loyalty programs, or value-added services that encourage higher transaction volumes and customer engagement.
- **Revamp Mobile Banking Offerings:** Banks should explore innovative ways to enhance mobile banking services. This could include offering a broader range of services, improving the user interface, increasing transaction limits, and ensuring robust security measures to build trust among users.
- **Collaboration and Partnership:** Banks could benefit from partnerships that enhance the reach and efficiency of their e-banking services. For example, sharing ATM networks with other banks could reduce operational costs while expanding customer access.
- **Customer Education:** To increase the adoption and effective use of e-banking services, banks should invest in educating their customers about the benefits and security of these platforms. This could involve targeted marketing campaigns and financial literacy programs.
- **Commercial banks should invest in making digital banking accessible and user-friendly** to attract more customers. This will help mobilize more resources, leading to increased profitability.
- **E-banking is essential for resource mobilization** as it allows customers to access and deposit their funds anytime and anywhere. Since resource mobilization is a crucial aspect of banking activities, banks should invest more in digital banking.

5.3 Implication for Future Research

The study was limited on the sample size as well as type of e-banking services, as it relied on data on the banks that have significant, if not all inclusive investment on all e-banking services. Accordingly, it was observed that all the sampled banks are not found at equal footing in terms of their investment as well as services related to all the explanatory variables. Hence, the inclusion of all other e-banking services, increasing the sample size by incorporating other banks as well as incorporating other endeavor.

These studies are used quantitative analysis based on the document and the data obtained from annual report of the commercial banks and different literature, so it doesn't get the customers and the staffs and the management concern regarding the electronic banking this lead for further study

The analysis is predominantly quantitative, focusing on financial performance metrics. Including qualitative factors, such as customer satisfaction and adoption challenges, could offer a more nuanced understanding of e-banking's impact.

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Annex

1. Dashen Bank

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
1	2016/2017	557	10.4	202	837	14.91	2.43002	27.8	36	63.6690647
1	2017/2018	711	74.6	305	910	17.76	2.04501	36	45.4	64.1666667
1	2018/2019	872	915.8	355	1397	14.85	1.80863	44.7	56.3	72.4832215
1	2019/2020	1094	1980	389	1283	18.48	2.25155	53.5	68.3	79.6261682
1	2020/2021	1293	2411	403	1340	17.05	1.82292	74.55	94.7	85.7142857
1	2021/2022	1553	3744	405	1456	20.2	2.47948	91.24	117.1	85.4997808
1	2022/2023	1888	4069	388	1388	18.43	2.46202	114.85	144.6	87.2442316

2 .Awash Bank

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
2	2016/2017	300.446	82.814	256	388	17.53	2.89119	32.9	40.01	80.8510638
2	2017/2018	479.16	192.98	265	486	22.97	3.25012	45.91	55.27	68.1768678
2	2018/2019	625.254	378.39	273	616	25.24	3.89504	62.46	74.64	75.7284662
2	2019/2020	811.2	487.5	468	581	21.64	3.48881	74.27	89.28	77.1509358
2	2020/2021	1622.4	750	565	1406	21.42	3.14229	108.07	128.69	80.9660405
2	2021/2022	2028	937.5	442	2355	25.49	3.51365	152.007	183.39	84.9960857
2	2022/2023	2480	1250	783	2471	32.55	3.73118	183.01	224.02	88.4699454

3. Abysinia Bank

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
3	2016/2017	132.103	107.71	114	200	18.42	2.11212	20.7	25.33	67.7777778
3	2017/2018	243.213	213.97	118	278	13.26	1.76048	25.79	31.98	69.7557193
3	2018/2019	365.39	336.66	118	278	15.7	1.9776	32.15	39.29	73.8413686
3	2019/2020	910.567	708.95	233	281	15.02	1.49938	47.63	56.89	78.2070124
3	2020/2021	987.984	910.97	969	300	15.51	1.28976	88.884	104.05	86.1572386
3	2021/2022	1250	226	1002	764	22.76	2.166	122.05	149.4	92.8553871
3	2022/2023	2940	276	1277	1195	19.89	2.04316	158.52	189.51	92.4236689

4. United Bank

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
4	2016/2017	152.787	37.784	69	156	15.18	1.01623	17.8	37.59	32.1867518
4	2017/2018	195.002	144.15	69	223	25.46	1.05396	23.066	28.03	53.749554
4	2018/2019	211.207	179.07	118	244	23.01	2.35481	29.92	35.74	60.7806379
4	2019/2020	293.856	272.27	119	323	17.63	2.27899	34.77	43.177	63.83028
4	2020/2021	381.961	419.92	120	373	15.99	2.75203	43.8	54.09	66.333888
4	2021/2022	451.248	722.92	162	362	15.05	1.61845	53.81	67.41	68.1204569
4	2022/2023	526.552	1118	191	484	2.452	2.78266	64.54	82.583	72.8721408

5. Wegagen Bank

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
5	2016/2017	155.41	11.86	196	282	17.49	2.87	15.6	20.9	66.6666667
5	2017/2018	220.0003	94.724	200	293	24.42	3.28	20.5	27.34	73.1707317
5	2018/2019	284.363	267.99	249	283	19.4	2.17	23.5	29.77	70.212766
5	2019/2020	373.232	574.46	297	273	17.69	2.45	30.1	38.2	78.7375415
5	2020/2021	528.01	101.98	296	273	16.5	2.1	31.5	39.7	86.6666667
5	2021/2022	544.157	1443.6	298	429	0.104	1.3	33.9	43.1	89.9705015
5	2022/2023	447.362	2026.7	319	436	11.93	1.7	42.8	53.4	93.2242991

6. Commercial Bank of Ethiopia

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
6	2016/2017	3700	1974.2	1501	6883	21.42	1.94764	365.1	490.0682	41.1531087
6	2017/2018	3000	2116.9	1671	11796	11.37	0.9254	451.8	579.8943	38.2899513
6	2018/2019	4400	3024.7	2642	2885	22.86	1.61135	541.4	712.8822	36.4536387
6	2019/2020	5600	3400	3072	3581	19.14	1.16367	594	819.2788	39.1432248
6	2020/2021	6800	4600	4050	4250	24.69	1.34064	735.29	991.319	37.9443485
6	2021/2022	7200	5300	4325	4780	23.06	1.42477	889.662	1157.57	32.9709485
6	2022/2023	8300	6600	5135	4950	23.37	1.33523	1043.72	1305.886	31.5485703

7. Nib Bank

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
7	2016/2017	54.651	24.781	163	77	16.65	2.34	32.23	21.1	33.198883
7	2017/2018	170.802	35.106	169	63	15.23	1.93	21.6	26.7	62.5
7	2018/2019	196.54	75.559	170	171	16.23	2.14	27.7	33.72	69.6750903
7	2019/2020	320.983	129.66	170	385	18.01	2.46	33.7	42.43	75.9643917
7	2020/2021	505.059	183.77	170	394	17.34	2.24	43.5	54.2	78.6206897
7	2021/2022	670.469	237.87	274	354	16.5	2.18	49.8	61.5	78.1124498
7	2022/2023	890.262	291.98	353	297	15.05	1.95	51.2	77.02	90.5892256

8. Abay Bank

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
8	2016/2017	48.2	40.933	35	71	26.73	3.64669	6.83236	8.692402	62.350369
8	2017/2018	76.73	72.02	50	76	20.12	2.57187	9.56609	12.32506	62.7215574
8	2018/2019	131.7	128.8	69	76	24.09	3.32239	11.5986	15.1063	66.4822591
8	2019/2020	173.905	139.98	123	40	24.06	3.2	16.099	20.204	73.010746
8	2020/2021	289.615	325.01	143	50	20.04	3	23.953	29.999	84.1731725
8	2021/2022	430.705	648.29	161	60	15.94	3.2	32.297	40.695	83.5464594
8	2022/2023	325	425	200	70	20.15	3	41.8	55	88.5167

9.Zemen Bank

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
9	2016/2017	22.105	7.981	20	22	19.71	2.72655	8.006	9.756518	52.2707969
9	2017/2018	35.75	8.88	28	60	15.97	2.17882	10.218	12.43891	51.0618516
9	2018/2019	42.965	9.1	35	78	20.74	3.29342	11.625	14.689	65.4623656
9	2019/2020	62.109	10.559	68	108	23.67	3.99611	14.417	18.496	67.3995977
9	2020/2021	73.746	14.795	93	178	21.25	3.788	18.994	25.15	73.8496367
9	2021/2022	97.935	28.273	100	319	23.59	4.20351	26.872	35.12	78.6022626
9	2022/2023	127.315	74.825	200	312	21.38	3.79446	37.079	47.784	84.6651744

10. Berhan Bank

id	year	DC '000'	MOBILE'000'	ATM	POS	ROE %	ROA %	DEPOSIT IN billion	ASSET bank size in billion	liquidity %
10	2016/2017	43.093	33.198	20	200	14.4	3.01084	7.67	10.535	70.482399
10	2017/2018	45.246	50.197	22	278	17.85	2.33044	10.862	14.068	66.2032775
10	2018/2019	54.649	52.063	40	278	15.76	2.29895	14.964	19.173	68.2705159
10	2019/2020	84.649	157.06	53	162	16.15	2.59094	16.609	21.351	76.5669215
10	2020/2021	114.649	262.06	75	208	5.201	0.72405	21.707	26.919	82.1025476
10	2021/2022	144.649	272.06	97	254	10.72	1.44722	26.027	33.065	85.207669
10	2022/2023	175	475	121	301	10.11	1.12915	33.782	45.045	85.5218756