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The Effect of Online Banking on Ethiopia's Commercial Banks' Bottom Lines

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Abstract:

Purpose: Examining how electronic banking affects the bottom lines of Ethiopia's commercial banks was the primary motivation for this research. The study's overarching goal is to analyse the effect on commercial banking in Ethiopia of a number of variables including ATM usage, debit card acceptance at points of sale, mobile and internet banking, bank size, and management effectiveness.

Methodology: Over the course of 2018–2022, this study focused on nine commercial banks as its primary unit of analysis. These nine commercial banks were chosen with care since they provided complete data and information during the study period. In our investigation, we used a special type of data called panel data. Separate electronic banking services such as ATMs, mobile banking, point of sale (POS), debit cards (DC), and internet banking (IB), as well as bank size and managerial efficiency, serve as supplementary controls in this investigation. Both descriptive and inferential statistics were used to help the study reach its goal. Mean, variance, and standard deviation are some of the central tendency measures that have been used in the study's descriptive analysis. Static panel data models were used for the econometric analysis in this work. These included the pooled ordinary least squares (POLS), fixed effect, and random effect models.

Results: Commercial banks' performance, as measured by return on asset (ROA), is negatively impacted by the logarithm of mobile banking and management efficiency, according to the fixed effect model. ROA is positively and significantly impacted by bank size and the logarithmic prevalence of internet banking. For this reason, commercial banks could benefit from revaluating certain of their electronic banking offerings, especially mobile banking.

Key Words: Electronic banking, Effect of Electronic banking in Ethiopia, Return on Asset, Fixed effect, Random effect.

1. Introduction

1.1 Background of the study

The banking industry plays a key role in any country's economy. An integral part of the economy, it strives persistently to leave its mark on the national economy. The nation's fiscal health is the responsibility of this organisation. Security First Network Bank was the first US bank to offer electronic banking to its customers in 1995 (Liao, Shao, Wang, & Chen, 1999). There are a lot of reasons why e-commerce hasn't spread to more African countries yet, and some of them may be exclusive to Africa (Darley, W. K., 2001). Financial institutions in Ethiopia are among those that have been exposed to this system as a result of its widespread adoption and introduction in recent years (Ayana, 2014). As a result of this trend towards globalisation, private financial institutions in Ethiopia, such as Dashenbank (DB) and Wegagen Bank (WB), followed the lead of the main state-owned bank, Commercial Bank of Ethiopia (CBE), in introducing the concept in 2001 (Gardachew, 2010). Traditional banking institutions in Ethiopia are transitioning to an electronic banking system to boost banking performance and attract more consumers. According to the banking industry, clients will feel more connected to their banks if they implement new technologies (Hasan, Baten, Kamil, & Parveen, 2010).The 2018 annual report from the National Bank of Ethiopia (NBE) states that the country's financial industry is completely secure, sound, well capitalised, and lucrative. There are currently seventeen commercial banks in operation in Ethiopia; the government owns the Commercial Bank of Ethiopia, and private businesses run the other sixteen. All of these banks, despite their very modest size, offer some form of internet banking (National Bank of Ethiopia, 2018), ATMs, point-of-sale terminals, and mobile banking.

1.2 Statement of the problem:

When financial services—such as account opening, bill payment, and money transfer—are provided via the internet, this is known as electronic banking. Both traditional banks with brick-and-mortar locations and online-only banks (sometimes known as "virtual banks") are capable of delivering these services. (Ayana, 2014).Mohammad (2012) argues that e-banking services profit both financial institutions and their clients. From the standpoint of banks, the benefits of e-banking include increasing market share and competitive advantage, worldwide connectivity, low-cost service delivery, customer-friendly design, real-time data upgrades, and simple transaction verification. In addition, it offers customers financial services that are quick, simple, trustworthy, and inexpensive (Mohammad, 2012). Ethiopia is one of the developing countries where e-banking is still in its infancy when compared to the developed world (Yitbarek & Zeleke, 2013).Moreover, e-banking, as mentioned above, encompasses a wide range of activities over time; it's more than just internet banking or automated teller machines (Alagheband, 2006; Ayana, 2014; Faisal & Ali, 2012; Jihyun, 2003; and Mols, 1998), despite the fact that most prior research has concentrated on these more well-known forms of e-banking. Previous research has looked at how different types of banks in Ethiopia are adapting to the rise of online banking (Gardachew, 2010, Ayana, 2014, Berhanu, 2015, Derbew, 2019), Girma, 2016, Dawit, 2017, etc.There are still holes in the literature despite the large number of local and international empirical investigations. Most of the prior research only looked at a small subset of the many facets of electronic banking that have an impact on commercial bank performance, and the results were inconclusive at best. Answers vary widely depending on the metric used to evaluate performance (Kannebley, Sekkel, &Arajo, 2010). These conflicting findings also prompted us to conduct this research. In addition, the vast majority of studies have either been case studies of individual banks or have surveyed the whole commercial banking industry. The current study is the first to investigate electronic banking in Ethiopia from the perspective of the researcher's interest among the commercial banks that are publicly traded in Ethiopia. It has been suggested that the quantity and direction of the effects of innovations change depending on the time frame considered (Kannebley, 2010). This study sought to address this knowledge deficit by analysing the impact of electronic banking on the financial performance of nine commercial banks in Ethiopia between 2016 and 2020. In Ethiopia, there are many distinct banks. The Commercial Bank of Ethiopia, the Awash International Bank, the Bank of Abyssinia, the Dashen Bank, the Wegagen Bank, the United Bank, the Nib International Bank, the Zemen Bank, and the Abayq Bank are among these institutions.

1.3 Objective of the study

The purpose of this research is to examine how several characteristics of Ethiopian commercial banks, such as their size and the effectiveness of their management, interact with various electronic banking mechanisms to affect the financial performance of these institutions.

1.4 Research Hypothesis

- The number of automated teller machines (ATMs) positively correlates with the return on equity (ROE) of Ethiopia's commercial banks (H1).

- It is hypothesized (H2) that the number of POS locations positively correlates with the return on equity of Ethiopia's commercial banks.

- In Ethiopia, commercial banks' return on equity is positively and significantly correlated with debit card usage, supporting Hypothesis (H3).

- Mobile banking usage positively correlates with commercial banks' ROA in Ethiopia (H4).

- The return on equity of Ethiopian commercial banks is negatively and significantly correlated with the use of online banking (H5).

- Commercial banks in Ethiopia have a favorable and statistically significant association between managerial efficiency and return on assets (H6).

- Commercial banks in Ethiopia have a positive and statistically significant association between bank size and return on equity (H7).

1.5 Scope of the study

The investigation was constrained geographically, conceptually, and chronologically. The investigation was limited to the nine NBE-approved commercial banks in Ethiopia. Awash International Bank, Bank of Abyssinia, Dashen Bank, Wegagen Bank, United Bank, Nib International Bank, Zemenbank, and Abay Bank are the remaining eight privately held banks. The focus of the research was strictly on how online banking would affect the bottom line. The study also makes use of secondary data gathered from nine Ethiopian commercial banks. Variables such as bank size, managerial effectiveness, and internet banking are used to explain the findings. The research also neatly bounded reports on e-banking services for the years 2018–2022.

2 Literature Review

According to Kamrul (2009), “e-banking is a type of banking service that involves the transfer of funds through electronic signals between financial institutions, as opposed to the exchange of cash, checks, or other negotiable instruments”. E-banking, which is also referred to as electronic funds transfer (EFT), involves the use of electronic methods to transfer funds between accounts as opposed to the traditional methods of check or cash transactions (Malak, 2007). E-banking, as commonly understood, pertains to the provision of banking services through the Internet, also known as online banking or Internet banking. This mode of banking delivery involves the use of the Internet as a remote channel for accessing banking services (Furst & Nolle, 2002, p. 5). The advent of the internet has eliminated temporal and spatial constraints in the realm of banking. Customers worldwide enjoy convenient, round-the-clock access to their accounts. An alternative characterization of electronic banking is that... According to Yang (1997), e-banking refers to the use of a computer system to access and manage banking information such as transaction details and statements, as well as to initiate various financial transactions such as transfers, payments, and service requests. This is achieved through remote communication with a financial service provider or a bank via a telecommunications network. It is important to acknowledge that electronic banking encompasses a broader range of services beyond online banking. Similar to other commercial enterprises, banks are increasingly leveraging information technology to enhance operational efficiency, elevate service standards, and expand their customer base. According to Farshad (2013), the primary drivers for consumers to adopt online banking are reduced fees as well as decreased reliance on paper-based processes and human intervention. According to Claessens and Kliengbiel (2000), the utilisation of electronic channels can result in reduced transaction costs, thereby creating a highly competitive environment.

E-banking encompasses a variety of platforms, such as internet banking, TV-based banking, mobile phone banking, and PC banking, which allow customers to access banking services via intelligent electronic devices such as personal computers, personal digital assistants, automated teller machines, point of sale systems, kiosks, and touch-tone telephones (Alagheband, 2006, p. 11). As detailed below, various types of electronic banking systems were evaluated. The system enables consumers to pay for retail purchases with check cards, a term recently coined to refer to debit cards. This particular card resembles a credit card, but with a significant distinction. According to Malak (2007), the funds allocated for the transaction are promptly transmitted from the debit card holder's account to the store's account.

The Electronic Fund Transfer at Point of Sale (EFTPOS) system enables customers to make payments for their purchases using checks or cash withdrawals without the need for any manual intervention by the sales staff. Furthermore, the system operates beyond the regular banking hours, thereby ensuring uninterrupted productivity for the bank beyond the standard working hours. The aforementioned development enables customers to save time by eliminating the need to physically visit bank branches or ATMs. The source cited is Tilahun's work from 2015.The inception of electronic banking in Ethiopia can be traced back to the latter part of 2001, when the foremost government-owned commercial bank in Ethiopia launched an automated teller machine (ATM) to provide services to its domestic clientele. machines, the bank also offers online banking services for its customers.

The Commercial Bank of Ethiopia (CBE) has been a member of Visa since November 14, 2005, with its headquarters situated in Addis Ababa. However, as a result of inadequate infrastructure, the organisation was unable to fully benefit from its membership. Although CBE was the first to introduce an ATM-based payment system and obtain Visa membership, it fell behind Dashen Bank, which pursued a more aggressive approach to maintaining its lead in the electronic payment system. The implementation of a card-based payment system by CBE has been progressing slowly, while Dashen Bank has been the only participant in the e-banking industry since 2006. The source cited is Gardachew's work, published in 2010.As per the findings of Wondwossen and Tsegai (2005), the Commercial Bank of Ethiopia (CBE) commenced the provision of automated teller machine (ATM) services in 2005, with a total of eight ATMs being installed in Addis Ababa. Automated teller machines (ATMs) facilitate the withdrawal of a restricted sum of funds from a customer's account at any given moment. The automated teller machines (ATMs) additionally facilitate customers verification of their account balance. To avail themselves of automated teller machine (ATM) services, patrons are required to possess ATM cards and confidential personal identification numbers (PINs). The ATM card is a type of smart card that is exclusively used for security purposes. The use of an ATM card in conjunction with a personal identification number (PIN) constitutes a cutting-edge method of authentication commonly referred to as two-factor authentication.

2.1Measures of Bank Performance

The efficiency with which a company uses its assets in its primary activity and generates revenue is a crucial factor in determining its financial performance. To compare comparable businesses within the same industry or to compare industries or sectors as a whole, this term is also used as an overall indicator of a company's financial health over a specific time period. There are numerous metrics that can be used to evaluate financial achievement, but they should all be considered collectively. Revenue from operations, operating income, and cash flow from operations are additional metrics that can be utilised (Jayawardhera & Foley, 2000). The company's primary objective is to generate profits. Return on assets, return on equity, and net interest margin are the three most common ratios used to calculate a company's profitability (Murthy & Sree, 2003). Return on investment (ROI) and return on assets (ROA) are significant factors in determining the profitability of a bank.

Profits as a proportion of total assets It indicates how effectively management converts company resources into revenue. In other words, it exemplifies the efficiency with which the company's assets are employed to generate profits. The ability of a company to convert its resources into a profit is further evidence of its management's quality. According to Wong (2004), a higher return on investment demonstrates resource effectiveness.

2.2 Internal factors affecting Performance of Commercial Banks

What the bank can influence directly are the internal factors. (Dang, 2011) Scholars frequently use the Capital Adequacy, Asset Quality, Management Efficiency, Earnings Capability, and Liquidity (CAMEL) framework to proxy for bank-specific characteristics. Commercial bank efficiency can be gauged by looking at their asset quality (Pastory&Mutaju, 2013). A good indicator of a bank's health is the quality of its assets. The percentage of nonperforming loans in a bank is a good indicator of

its asset quality (Chisti, 2012).One of the determinants of commercial bank financial success is the size of the bank, which may be quantified by the sum of its deposits and/or assets. Research into what factors make banks successful has found that institution size is high on the list (Kosmidou K., 2008). The market-power (MP) hypothesis states that a company's market power and profitability will grow as its size increases relative to its competitors. Athanasoglou, Sophocles, and Matthaios (2005) propose a theory known as the Structure, Conduct, and Performance (SCP) hypothesis.Management effectiveness is typically qualitative and is gleaned from an individual's impressions of management practises, company culture, and regulatory processes (Nazir, 2010). Growth in total assets, loans, and profits are some examples of financial measures that can be used to illustrate this phenomenon (Ongore & Kusa, 2013). Expenses are a major factor in a bank's bottom line since they are directly tied to the idea of efficient management. The effectiveness of management reflects how well the bank's leaders are able to allocate resources to increase profits. Management is more effective at maximising operational efficiency and generating income if operating profits as a percentage of total income (revenue) are high. The ratio of operating expenses to total assets is another key indicator of managerial competence. Profitability is hypothesised to be inversely related to the operating expense-to-total asset ratio. In this respect, the amount of operating expenses is set by management quality, which in turn affects profitability (Athanasoglou, 2005).

2.3 External factors affecting Performance of Commercial Banks

The bank can do little to prevent the impact of external circumstances. The external issues that commercial banks must contend with constitute the macroeconomic setting in which they function. For inflation to have a significant impact on bank profits, it must be expected to some degree (Vong and Chan, 2009). Having a clear idea of what the inflation rate will be allows banks to set interest rates that will bring in more money than they spend (Athanasoglou, 2004).

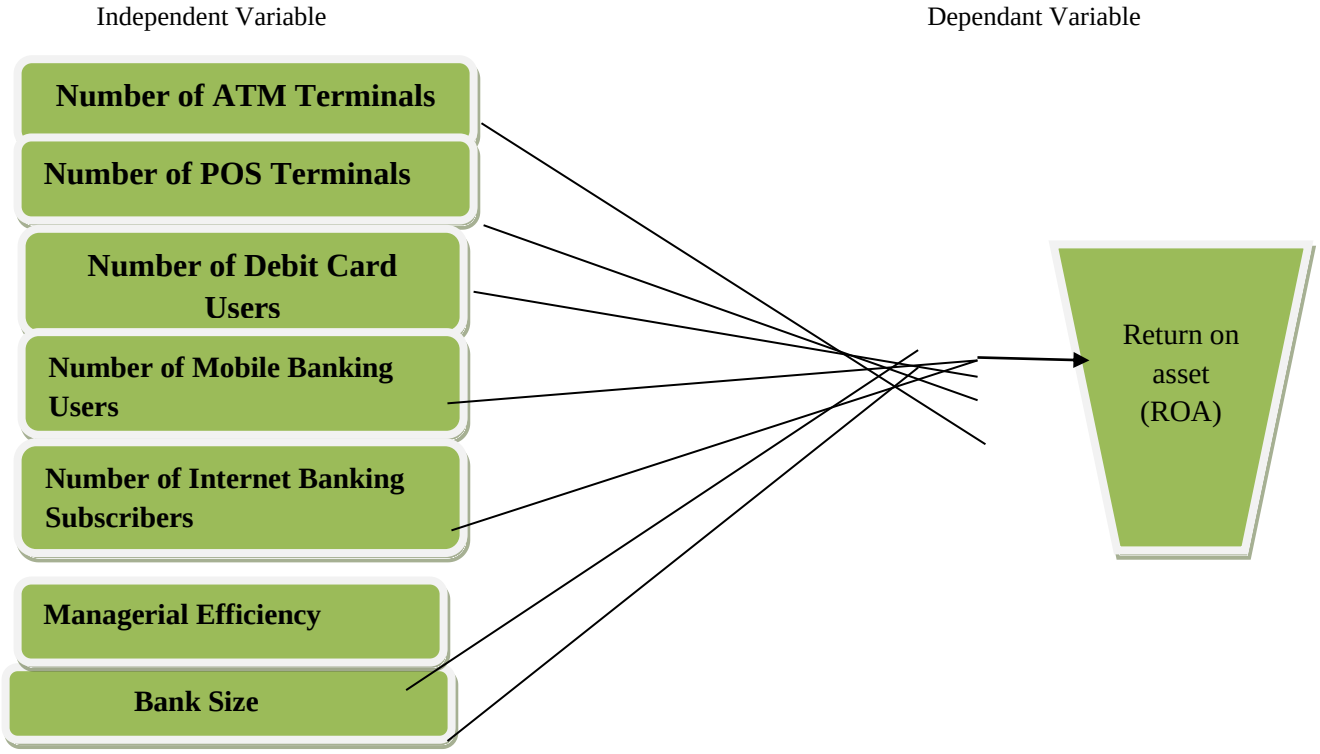
2.4 Summary of Literature and Research Gap

It is clear from the above survey of related literature that studies on the effects of e-payment on financial performance have been conducted, albeit without a systematic strategy. E-banking adoption, barriers and benefits, challenges and prospects, customer satisfaction, and behavior towards e-banking in Ethiopian commercial banks have all been the primary focus of the reviewed literature, as has their relationship to the profitability of banks. The study is more extensive because no other study the researcher is aware of, either locally or in the African region, has examined the influence of electronic banking on the financial performance of commercial banks, focusing on the seven characteristics listed below. Most research on the effects of e-banking on commercial banks has not come to any firm conclusions. The majority of published studies extrapolate results from a single or small number of variables. This research aims to address these knowledge gaps by analyzing the impact of commercial banks' financial performance in Ethiopia from 2016–2020.

2.5 The conceptual framework or model of the study

Figure 2.1 shows the conceptual framework for this study, which shows how e-banking services affect the bottom lines of private banks in Ethiopia. Commercial banks' financial performance is measured by their return on assets. Figure 2.1 shows how e-banking services, such as ATMs, POS terminals, debit card users, mobile banking users, internet banking users, managerial efficiency, and bank size, affect this metric. The ROA shows how well management is able to make the most of the return on assets.

Figure 2.1- Theoretical framework-dependencies between variables



Source: Developed based on the reviewed literature

3. Research Methodology

3.1 Research design and Approach

The research design for an empirical study is the overarching strategy for gathering information. It is a "blueprint" for conducting empirical studies to verify or refute certain claims. To wit: Bhattacherjee, 2012. The primary purpose of this research is to analyse how e-banking has influenced the success of Ethiopia's commercial banks. This goal is attained through the employment of a quantitative, explanatory research strategy. According to Saunders (2009), "explanatory research" is defined as "studies that establish causal relationships between variables." A quantitative approach is one that relies heavily on numerical evidence, as defined by the work of Bryant (2007). Here, all data is processed using quantitative analytical techniques, which also help the researcher determine what is being studied, formulate specific questions that can yield numerical data, and conduct the inquiry in an objective and unbiased fashion. The pragmatic research theory, which this study also follows, holds that ideas are only useful if they help people take action.

3.2- Population of the study and Sampling Techniques

When people who share some characteristics are added up, that group is called a population (Creswell J., 2009). Nine commercial banks were analysed: the Commercial Bank of Ethiopia, the Awash International Bank, the Dashenbank, the Bank of Abyssinia, the Wegagen Bank, the Abay Bank, the Nib International Bank, the United Bank, and the Zemen Bank. In this study, researchers used a non-random selection technique called purposive sampling to select their sample units. Miller and Yang (2008) and Creswell J. (2009) describe "purposeful sampling" as "the selection of specific units from the universe to form a sample that is meant to be representative of the entire universe." Burns and Grove (2003) stress the importance of using purposeful sampling since it enables researchers to select study participants who will provide the most in-depth understanding of the topic at hand.

The sample banks used in this research were chosen because they had recently published data (banks that have reported on their e-banking services since 2016). According to the study's author, the data collected is sufficient to draw meaningful conclusions regarding how online banking has impacted the productivity of commercial banks.

3.3-Data Type, Sources, and Collection

Creswell (2003), in his book on research design, makes it clear that post-positivists' knowledge claims are followed by quantitative research approaches that rely on secondary data. This research makes use of panel data, a type of secondary data that combines cross-sectional and time-series information. Panel data, which entails combining observations on a sample of units over a period of time, yields insights not apparent in either cross-sectional or time-series research conducted separately (Brooks, 2008). According to Brooks (2008), a panel data set has several key benefits. First, it can address issues that arise from the omission of UI, which includes individual-specific, time-invariant, unobserved heterogeneity; second, it can solve the problem that arises when data collection errors occur; third, it can address a broader range of issues and tackle more complex problems; and fourth, it can address omitted variables. According to Creswell (2003), secondary data includes things like a company's internal journals, manuals, and financial statements. Commercial bank and National Bank of Ethiopia annual reports, as well as published and unpublished reports gathered from the E-banking departments of sampling banks, were used to compile the data for this study. The time frame of this investigation is from 2016 to 2020. This is so that we can take into account the most recent data on how e-banking has impacted the success of commercial banks.

3.4- Data analysis

Descriptive and inferential statistics were used to examine the data and draw conclusions about how e-banking services have affected the productivity of commercial banks in Ethiopia. In the study's descriptive statistics section, we present the mean, median, mode, standard deviation, and correlation coefficient for each of the investigated variables. This analysis employs both descriptive and inferential statistics, the latter of which are derived from a parametric econometric model. Due to the panel format of the data, static panel data models were used for the econometric analysis, including fixed effect, random effect, and pooled ordinary least squares. The fixed effect model was selected for this study because it scored higher on the Hausman specification test. Stata version 15 was used for the statistical analysis.

3.5-Analytical Model

In this research, we used models from linear panel data analysis. Different linear panel data models would be used in panel data analysis, as stated by Badi H. Baltagiwould be used in panel data analysis, as stated by Badi H. Baltagi (2005). Linear panel data models such as pooled ordinary least squares, fixed effects, and random effects are among the most well-known types. The standard econometric formula for panel data models looks like this:

$$Z_{it} = \theta + X_{it}'\beta + \varepsilon_{it} \quad \text{----------3.1}$$

Where, I indicate units in our case commercial banks, t indicates time period which the study covers, θ is scalar parameter that is constant, $Xisvectorofexplanatoryvariables, \beta$ is vector of slope parameters with dimension of$K \times 1$. $\varepsilon_{it}$is error component. The error component of panel models has two parts.

$$\varepsilon_{it} = \mu_i + \omega_{it} \quad \text{----------3.2}$$

Where μ_i stands for individual specific characteristics of units (commercial banks). Individual specific properties of units refer to unique features for commercial banks exhibited in their banking operation. This individual specific is time invariant and unobservable that is why merged with error component. Whereas ω_{it} is the other component of error term that varies both with time and across units.

Fixed Effect model

Under fixed effect model units individual specific (μ_i) is fixed parameter that would be estimated but v_{it} is independent and identically distributed with zero mean and constant variance.

$$Z_{it} = X_{it}'\beta + (\mu_i + v_{it}) \quad \text{----------3.3}$$

If we hold the following assumptions:

a) Individual specific (μ_i) is freely correlated with explanatory variables (X_{it}).
b) v_{it}andX_{it} are independent each other i.e. $E(v_{it}X_{it}) = 0$.

If we apply ordinary least square in equation 3.3, estimated parameters are biased due to endogeneity problem since $E(\mu_i X_{it}) \neq 0$. However, if fixed effect is applied for equation 3.3, the result will be efficient and consistent. Fixed effect model allows that individual specific (μ_i) and explanatory variable can correlate each other. Fixed effect model can solve the endogeneity problem by applying within transformation (Greene, 2003). We can find the mean of terms in equation 3.3:

$$\bar{Z}_\iota = \bar{X}_\iota\beta + (\mu_i + \bar{v}_\iota) - 3.4$$

$$y_{it} = (Z_{it} - \bar{Z}_\iota) = (X_{it} - \bar{X}_\iota)\beta + (v_{it} - \bar{v}_\iota) - - - - - - - - - - - - - - - - 3.5$$

Then, it is possible to apply ordinary least square and unbiased estimators can be estimated.

Random Effect Model

Random effect model assumed that individual specific characteristics of units are random variable and independent to covariates of the model. Random effect model has another strong side that it can account time invariant characteristics of units. The constant term of random effect model captures all time invariant characteristics of units(Greene, 2003).

$$Z_{it} = X_{it}\beta + \varepsilon_{it} -3.6$$

Random effect model has the following working assumptions:

a) Individual specific and covariates are independent each other i.e. $E(\mu_i|X_{it}) = 0$
b) Strict exogeneity i.e. $cov(v_{it}, X_{it}) = 0$

Fixed effect model uses generalized east square (GLS) to transform equation 3.6 in which it satisfies the assumption of ordinary least square (OLS).

3.6- Measuring variables

The impact of electronic banking on the bottom lines of Ethiopia's commercial banks is the topic of this section, which analyses relevant variables. In the following table, we summarise the variables and the methods used to measure them.

3.6.1- Interdependent conditions

3.6.1.2 Asset Return (ROA)

Traditional indicators of a bank's health include pretax profit and return on assets (ROA). The return on assets is calculated by deducting the pretax profit margin from the total asset value. The efficiency with which a bank converts its assets into earnings is quantified by this ratio (Khrawish, 2011). Here, we examine commercial banks through the lens of return on assets (ROA). Ross (2006) argues that, from an accounting perspective, return on assets (ROA) is a comprehensive indicator of bank success. It is the benchmark by which all other management evaluations must be compared. It demonstrates the bank's management's skill in maximising profits from its assets.

3.6.2: External Variables

The following hypothesis is provided based on independent variables that may affect the financial performance of commercial banks in Ethiopia: Everything relevant was included in the literature review.

3.6.2.1: Number of Operating Automated Teller Machines

Customers of a financial institution can use an ATM, which is a piece of electronic telecommunications equipment available around the clock, to conduct financial transactions. According to Maleki and Akbari's (2010) research. Delgado (2004) argues that the expansion of digital communication channels has had far-reaching consequences for the banking industry.

The automated teller machine (ATM) revolutionised the computerised distribution of retail banking services in 1967, and Barclays Bank was an early adopter of this technology. As a result, this evaluation took into account the closeness of ATMs.

3.6.2.2Number of Non-Bank Point-of-Sale Terminals (Sales Terminals)

The POS (point of sale; Habibzadeh and Mirmajidi, 2011) is where most purchases are made and where money is exchanged. Here, we will use the total number of point-of-sale terminals as our metric for determining how close one is to a POS system. Dieterich (2014) argues that the word "point-of-sale" (POS) includes several different kinds of services.

3.6.2.3: Mobile Banking User Count (NMB)

With mobile banking, consumers can perform transactions like account inquiries and money transfers with only a few short text messages. (Ayana, 2012). The number of mobile banking users was used as a proxy for mobile banking adoption in this study.

3.6.2.4 Count of People Who Use Debit Cards

Customers with checking accounts can get debit cards from their banks, which can be used at ATMs to withdraw cash and at brick-and-mortar and online merchants to make purchases (Nyanamba and Steve, 2014). The NDC user base is a surrogatefor actual debit card usage.

3.6.2.5: NIB Subscriber Count for Online Banks

Customers of a financial organisation, such as a retail or virtual bank, credit union, or society, can use Internet banking to make financial transactions on the institution's secure website (Alabar, 2012). Any financial dealings involving the use of the Internet are fair game. Banks now offer a variety of services through their websites, including the ability to check account balances, interest rates, and currency exchange rates. The number of customers who make use of internet banking services is the dependent variable in this analysis.

3.7 Confounding Factors

3.7.1 Institutional Count

According to Kapur and Gualu (2011), introducing this independent variable can account for size-related economies and diseconomies of scale (either scale economies with reduced costs or scope economies with loan and product diversity, allowing entry to areas that a small bank cannot penetrate). Large banks benefit from economies of scale because they lower the cost of receiving and processing information, allowing for greater financial flexibility and wider spreads. Because of this, the cost of funding is reduced, allowing larger banks to boost their net interest margin. The greater a bank's branch network, the easier it is for it to access deposit markets and deploy savings at lower costs. Larger banks are more likely to be profitable because they can take advantage of economies of scale in their operations. The size of a bank can be gauged by looking at its year-end total assets. Most empirical studies have found that as a company grows, its profits do as well.

3.7.2 Efficiency in Administration

The expense management variable can be used as a proxy for the bank's management quality; it is computed by dividing the operational expense ratio by the bank's total income (Kombo, 2009). Interest expenses, operating expenses, depreciation, and taxes all contribute to a bank's total cost. In this case, only operating expenses can be directly attributed to decisions made by the bank's management. A good indicator of how well costs are being managed is the percentage of income that goes towards these operating costs. How much of a bank's revenue is spent on running the business is an indication of how well the institution is managed; if this ratio is high, the bank's administration is inefficient. This will have a negative impact on the bank's bottom line over time (Rao and Lakew, 2012).

4. Data Analysis and Discussion

4.1 Descriptive Statistics

Overall, between-group and within-group data for each variable have been described as best as possible in the study's descriptive section. Statistics of a specific variable in both the cross-sectional and longitudinal dimensions are indicated by the term "overall statistics." The time dimension is disregarded in favour of a cross-sectional view of a particular variable's statistics, known as "between statistics." Important statistics for a given variable can be estimated within statistics by focusing just on the temporal dimension. Since it is possible to compare the properties of a given variable across units and time, between- and within-group panel statistics are particularly useful. Within-bank variation is often smaller than between-bank variation for all variables considered. One such variable can be observed. The standard deviation of return on assets within a bank is 0.019, whereas it is 0.110 between banks. This suggests that within-bank variability is smaller than between-group variability. Detailed statistics for each variable are summarized below.

Table 4.1 panel descriptive statistics

Variable		Mean	Std. Dev.	Min	Max	Observation
ROA	Overall	0.0853333	0.1071235	0.02	0.3	N = 45
	Between		0.1104446	0.024	0.28	n = 9
	Within		.0196561	0.0053333	0.1053333	T = 5
					3	
NATM	Overall	420.8889	614.1178	20	3072	N = 45
	Between		581.2435	46.8	1936.6	n = 9
	Within		264.5936	-626.7111	1556.289	T = 5
NPOS	Overall	1346.022	2456.551	37	11796	N = 45
	Between		2371.179	64.8	7599.2	n = 9
	Within		960.8795	-2672.178	5542.822	T = 5
NDC	Overall	726929.3	1123133	10216	5603906	N = 45
	Between		1099171	39600	3600677	n = 9
	Within		403837.5	-73747.31	2730159	T = 5
NMB	Overall	495790.6	826264.9	11564	4635830	N = 45
	Between		736309.2	33900	2428753	n = 9
	Within		435716.4	-832962	2702868	T = 5
NIB	Overall	6961.089	13097.54	810	55351	N = 45
	Between		13269.28	1588.2	42322.6	n = 9
	Within		3387.971	-8861.511	19989.49	T = 5

BS	Overall	10.51911	0.6686548	8.79	11.91	N = 45
	Between		0.6773567	9.166	11.758	n = 9
	Within		0.1731972	10.14311	11.01311	T = 5
ME	Overall	0.6091111	0.1831023	0.27	0.82	N = 45
	Between		0.1882661	0.316	0.784	n = 9
	Within		0.0361185	0.5391111	0.6891111	T = 5

Source: STATA 15 output

In addition to the aforementioned measures of central tendency and dispersion, this research also provides measures of variability such as means, standard deviations, minimums, maximums, kurtosis, and skewness. The maximum and minimum value of ROA, NATM, NPOS, NDC, NMB, NIB, BS and ME is 0.02 and 0.3, 20 and 3072, 37 and 11796, 10216 and 560390, 11564 and 463583, 810 and 55351, 8.79 and 11.91, 0.27 and 0.82 respectively. Commercial banks over the time period 2016- 2020 had wide gap in some variables. For instance, the minimum number of automated teller machine (NATM) is 20 but its maximum is 3072.with the mean of 420. The standard deviation of NAM is 614 which is higher than the mean of number of automated teller machine (NATM). This implies that banks extreme difference in their corresponding number of automated teller machine (NATM). Likewise the standard deviation of number of debit card (NDC) is 112313 which indicates large variability across banks in terms of NDC.

Table 4.2 Descriptive statistics for pooled data

stats	ROA	NAM	NPOS	NDC	NMB	NIB	BS	ME
N	45	45	45	45	45	45	45	45
mean	.0853333	420.8889	1346.022	726929.3	495790.6	6961.089	10.51911	.6091111
Sd	.107123	614.117	2456.55	112313	826264.	13097.5	.668654	.183102
min	.02	20	37	10216	11564	810	8.79	0.27
max	.3	3072	11796	560390	463583	55351	11.91	0.82
kurtosis	3.12387	11.9188	11.4692	10.4342	15.8844	8.78379	4.22712	1.79348
skewness	1.41836	3.03762	3.02874	2.72832	3.40232	2.69615	-.432893	-0.652729

Source: Stata 15 out put

The researchers also sought to determine the yearly variation in each variable's mean, standard deviation, minimum, maximum, kurtosis, and skewness. The standard deviation of each variable was calculated annually and used in this descriptive section of the study. . The mean and standard deviation of ROA is almost same across the period. This means the mean and standard deviation of ROA from 2016-2020 have not significant difference. This indicates that commercial banks have same financial performance over the period 2016-2020.

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Table 4.3 Descriptive statistics over time dimension

Year	2018							
stats	ROA	NATM	NPOS	NDC	NMB	NIB	BS	ME
N	9	9	9	9	9	9	9	9
mean	0.0655556	257.4444	1079.333	463150.1	213725.7	4025.889	10.31667	.5866667
Sd	0.0763399	260.898	1967.004	890270.1	343309.9	8436.17	.7395269	.1899342
min	0.02	20	37	10216	11564	810	8.79	.27
max	0.2	889	6269	2800000	1100000	26500	11.58	.77
kurtosis	2.774318	5.005489	6.842559	6.705863	6.294746	7.098161	3.790916	1.919817
skewness	1.32508	1.677996	2.375495	2.334415	2.192515	2.465455	-.543043	-.7077903
year	2019							
Stats	ROA	NAM	NPOS	NDC	NMB	NIB	BS	ME
N	9	9	9	9	9	9	9	9
mean	0.09	337.2222	1213.222	538381.6	331818.7	6079.889	10.41556	.5911111
Sd	0.1190588	448.78	2127.565	922370.4	597557.7	12734.1	.7451361	.1816896
min	0.03	40	59	30340	22021	980	8.85	.3
max	0.3	1501	6811	2950000	1900000	40000	11.69	.77
kurtosis	2.785714	6.416169	6.770051	6.607829	6.702287	7.095279	3.969508	1.824474
skewness	1.336306	2.219504	2.351515	2.299453	2.330192	2.464321	-.592059	-.6898906
year	2020							
stats	ROA	NAM	NPOS	NDC	NMB	NIB	BS	ME
N	9	9	9	9	9	9	9	9
mean	0.0888889	393.2222	1807.889	603063.4	412960.6	6662.333	10.50444	.6111111

Sd	0.1198379	510.7291	3762.111	903047	645214.9	13269.1	.7155612	.184421
Min	0.02	40	76	39000	32500	1200	9.01	.3
max	0.3	1708	11796	2949477	2100000	42000	11.76	.77
kurtosis	2.776107	6.24444	7.006541	6.457725	6.616063	7.089512	4.026707	1.750768
skewness	1.32736	2.156519	2.433358	2.242975	2.292927	2.462337	-.5091828	-.6572088
	year	2021						
stats	ROA	NAM	NPOS	NDC	NMB	NIB	BS	ME
N	9	9	9	9	9	9	9	9
mean	0.0933333	508.6667	1628.333	819414.9	621984	8177.778	10.63778	.6055556
Sd	0.1175798	763.6315	2996.349	1112246	716405	14861.46	.6131227	.2150065
min	0.02	65	76	44000	37000	1850	9.52	.29
max	0 .3	2513	9539	3700000	2407933	47762	11.85	.81
kurtosis	2.758197	6.713083	6.858341	6.390694	5.545862	7.093497	3.74908	1.546446
skewness	1.311573	2.326429	2.38259	2.205729	1.919594	2.463741	.1743723	-.606246
	year	2022						
stats	ROA	NAM	NPOS	NDC	NMB	NIB	BS	ME
N	9	9	9	9	9	9	9	9
mean	0.0888889	607.8889	1001.333	1210636	898464.3	9859.556	10.72111	.6511111
sd .	0.1198379	934.8943	1048.882	1683314	1422198	17072.18	.5906023	.1792655
min	.02	69	76	48000	40000	3101	9.66	.39
max	.3	3072	3581	5603906	4635830	55351	11.91	.82
kurtosis	2.776107	6.821057	5.287433	6.580956	6.744933	7.104583	3.810914	1.54436
skewness	1.32736	2.36321	1.80000	2.26986	2.33610	2.46772	.275820	-.6192661

Source: STATA 15 output

4.2 Correlation Analysis

The strength of a relationship between two variables can be easily measured using correlation. The direction of association and multicollinearity can be determined with the help of the linear correlation coefficient (Senthilnathan, 2019). Pairwise correlation was used to determine the strength of the relationship between commercial bank performance and the independent variables. The following table provides a concise overview of the inter-pair correlation.

Table 4.4 Correlation

	ROA	NATM	NPOS	NDC	NMB	NIB	BS	ME
ROA	1.0000							
NATM	-0.2465	1.0000						
	0.1026							
NPOS	-0.1460	0.7811*	1.0000					
	0.3387	0.0000						
NDC	-0.2581	0.9674*	0.7804*	1.0000				
	0.0870	0.0000	0.0000					
NMB	-0.2313	0.9625*	0.6876*	0.9612*	1.0000			
	0.1262	0.0000	0.0000	0.0000				
NIB	-0.1707	0.9548*	0.8672*	0.9562*	0.9257*	1.0000		
	0.2622	0.0000	0.0000	0.0000	0.0000			
BS	-0.4676*	0.7183*	0.6570*	0.7480*	0.6891*	0.6633*	1.0000	
	0.0012	0.0000	0.0000	0.0000	0.0000	0.0000		
ME	0.2700	-0.3932*	-0.3927*	-0.3635*	-0.3094*	-0.4467*	-0.2180	1.0000
	0.0729	0.0075	0.0076	0.0141	0.0387	0.0021	0.1503	

Source: STATA output of Correlation Matrix

At the 5% level of significance, a negative association was found between bank size and ROA (a measure of a bank's performance). This result is expected since as the size of banks increases, the management will be difficult and its performance will be declined. Again, debit card (NDC) and bank performance (ROA) have negative correlation at 10% significance level.

4.3 Econometric Analysis

The econometric empiric of this study has started with pooled ordinary least square (POLS). This model does not regard different units and time variables of the study. Pooled ordinary least square (POLS) considers same intercept and coefficient for all banks and time. Individual differences are ignored Pooled OLS result of the study shows that only two variables that are BS and logNPOS have significant effect on logROA. BS has significant and negative effect on logROA at 5%

significance level. ROA shifts by 77% when BS changes by one unit. There is a positive and statistically significant relationship between logNPOS and logROA at the 1% level. If there is a 1% shift in NPOS, there will be an 87% shift in ROA.

Table 4.5 Pooled regression

logROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
BS	-0.779	0.374	-2.08	0.044	-1.536	-.022	**
ME	0.475	0.772	0.62	0.542	-1.089	2.039	
logNATM	-0.654	0.442	-1.48	0.148	-1.551	.242	
logNPOS	0.871	0.232	3.75	0.001	0.4	1.342	***
logNDC	-0.305	0.279	-1.09	0.282	-.871	.261	
logNMB	0.163	0.212	0.77	0.448	-.267	.593	
logNIB	0.101	0.187	0.54	0.593	-.279	.481	
Constant	3.958	2.49	1.59	0.12	-1.088	9.004	

Mean dependent	-3.040	SD dependent	0.973
R-squared	0.594	Number of obs	45.000
F-test	7.736	Prob> F	0.000
Adjusted R-squared .	0.5173	Bayesian crit. (BIC)	114.132

**** p<.01, ** p<.05, * p<.1*

Source: STATA output for pooled regression

As measured by both F-statistics and R2, the overall model fitness of pooled OLS is good. F-statistics have a probability value of 0.000, or less than 5%. The pooled OLS has a respectable R2 of 59.4 percent and an R2 of 51.7 percent. As a result, we may conclude that the pooled OLS of this study is adequate, despite the inherent restrictions of POLS.

4.3.1 Fixed Effect Model

A fixed effect model works when the intercept term and normal error component are unit- and time-invariant and independent of explanatory factors (Badi H. Baltagi, 2005). Researchers estimated the model with a fixed effect size. The fixed effect model shows that just two independent factors affect ROA. These variables are logNATM and ME. At 5% significance, managerial efficiency (ME) and mobile banking logarithms negatively affect logROA. Every unit improvement in managerial efficiency slows the return on assets by 1.83. Managerial efficiency has an unexpected effect. Faulty management performance appraisals may have caused this unexpected result. Operating expenses compared to total income have traditionally measured banking efficiency. If a bank's operating expense ratio is high, management is inefficient at controlling costs. The bank's bottom line will suffer (Rao and Lakew, 2012). Thus, these banks' inefficiencies This suggests a low return on running costs. Mobile banking (logNATM) also lowers ROA by 5%. Mobile banking expansion decreases ROA by 19.9%. ME shifts 2.03% ROA per unit. Again, 1% NMB shifts ROA by 22%. Thus, banks may lose 22% of their efficiency as customers adopt mobile banking. It's disappointing. Mobile banking consumers are highly mobile, so this is

expected. The fixed effect model also depends on individual attributes and explanatory factors. The explanatory factors and individual-level error components have a 74.17% negative correlation. 98.61% of the error term is individual-specific.

Table 4.6 Fixed effect regression

logROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
BS	0.34	.247	1.38	.178	-.164	.845	
ME	-2.027	.825	-2.46	.02	-3.715	-.34	**
logNATM	0.015	.173	0.09	.931	-.338	.368	
logNPOS	0.031	.125	0.25	.804	-.224	.287	
logNDC	0.16	.101	1.58	.125	-.047	.366	
logNMB	-0.226	.079	-2.87	.008	-.386	-.065	***
logNIB	0.171	.117	1.46	.156	-.069	.411	
Constant	-6.297	1.897	-3.32	.002	-10.178	-2.416	***

Mean dependent var	-3.040	SD dependent var	0.973
R-squared		Number of obs	45.000
Within	0.4368	sigma_u	1.3467136
Between	0.1213	sigma_e	0.16010461
Overall	0.0985	rho	0.98606324
corr(u_i, Xb) = -0.7417			
F-test	3.21	Prob> F	0.0121

*** *p<.01, ** p<.05, * p<.1*

F test that all u_i=0: F(8, 29) = 78.87 Prob> F = 0.0000

Source: STATA output for fixed effect regression

4.3.2 Random-Effect Model

The random effect is another popular static panel data analysis method. (Schmidt, 2013) If the unit-specific effect is random and uncorrelated with explanatory variables, the random effect model is applicable. This model outperforms the fixed effect for time-invariant traits. Fixed effects exclude time-invariant-specific effects, whereas random effects might incorporate them by assuming individual attributes from a probability distribution. Each characteristic has a zero and constant variance under random effects.

This study used a random effect model. This model indicates that the logarithm of mobile banking (logNMB) negatively impacts commercial banks' return on assets (logROA) at the 1% significance level. Assuming all conditions remain unchanged, commercial banks will perform 23% worse when mobile banking customer numbers rise by 1%. In both random

and fixed effects, the mobile banking logarithm affects commercial banks. Internet banking (logNIB) also affects ROA significantly. At 10% significance, LogNIB has a beneficial effect. As online banking customers rise by 1%, commercial bank performance will increase by 21.2%.
Random effect model fitness is poor. The model Wald test is negligible. This study doesn't need a random effect model formulation.

Table 4.7 Random Effect regression

logROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
logNAM	-0.013	0.192	-0.07	0.946	-0.389	0.363	
logNPOS	0.05	0.13	0.38	0.703	-0.206	0.305	
logNDC	0.173	0.116	1.49	0.136	-0.054	0.399	
logNMB	-0.23	0.09	-2.56	0.01	-0.406	-0.054	**
logNIB	0.212	0.126	1.69	0.091	-0.034	0.458	*
BS	-0.012	0.263	-0.04	0.965	-0.527	0.504	
ME	-0.772	0.796	-0.97	0.332	-2.333	0.789	
Constant	-3.759	2.053	-1.83	0.067	-7.783	0.265	*

R-squared		Number of obs	45.000
Within	0.3663	sigma_u	0.72330171
Between	0.0121	sigma_e	0.16010461
Overall	0.0051	rho	0.95329166
corr(u_i, X)=0		Wald chi2(7)	11.72
		Prob> chi2	0.1100

**** p<.01, ** p<.05, * p<.1*

Source: STATA output for random effect regression

4.3.3 Hausman Test

It's a test of multiple standards to see which works best. If two estimators are consistent and efficient within a specific working framework, then there should not be a substantial variation in their parameter estimations, which is the core idea behind the Hausman test. The Hausman test examines the correlation, or lack thereof, between individual effects and the explanatory variables in both the random and fixed effect models. The random effect model does not function if the specific effects of individuals correlate with any explanatory variable, and there is no linear unbiased estimator. The Blue and Gauss-Markowitz assumptions will hold, as will correlations between specific effects and any explanatory variable. Therefore, if the specific effects of individuals correlate with their respective explanatory variables, a fixed effect model is acceptable (Schmidt, 2013).

H_0 : Random effect model is appropriate and consistent

H_a : Fixed effect model is appropriate

According to the Hausman test, the fixed effect model is preferable to the random parameter model in this research. The Hausman test probability is lower than 5%. This indicates that there is a connection between banks' unique qualities and underlying variables. Consequently, the fixed effect model is appropriate since it takes into consideration the correlation between individuals and regressors. Even when evaluating random effect model fitness using the Wald test, the results are unsatisfactory. Wald's test returns a probability value of 0.11%, which is higher than the typically accepted cutoff for significance. This suggests that a random model is not appropriate.

Hausman (1978) specification test

	Coef.
Chi-square test value	33.48
P-value	0.0000

Source: STATA output for hausman specification test

4.4 Heteroskedasticity Test

When the variance of the disturbance term is assumed to be constant in the estimation, heteroskedasticity is triggered. Heteroskedasticity refers to the fact that the error term in the model has a non-constant variance when controlling for a particular explanatory variable. If the coefficients of the explanatory variables are not biassed by heteroskedasticity, then the standard error is wrong, leading to erroneous inference due to an overestimation or underestimation of the test statistics and the confidence interval (Wooldridge, 2010). After a fixed effect regression, the study checked for non-constant variance. The results of the test suggest that heteroskedasticity is present in the fixed effect model. Therefore, robust fixed effect regression was used in the study to account for the issue of heteroskedasticity.

Breusch-Pagan heteroskedasticity test

H_0: $Constant\ variance$

H_a: $non-constant\ variance$

chi2 (9) = 1581.46

Prob>chi2 = 0.0000

Source: STATA output,*Breusch-Pagan*

4.4.1 Robust Fixed Effect Model

Even though the Hausman test suggests that a fixed effect model specification is appropriate, heteroskedasticity affects the findings. The best strategy for accounting for heteroskedasticity is robust regression. The analysis was a powerful fixed-effects regression. The robust regression demonstrates the significant effects of bank size (BS), managerial effectiveness (ME), mobile banking (logNMB), and internet banking (logNIB) on commercial banks' return on assets (logROA) performance. The logarithm of managerial efficiency and the logarithm of mobile banking (logNMB) have a significant negative influence on the logarithm of return on assets (logROA) at the 5% and 1% significance levels, respectively. The same result is obtained with a fixed effect model. However, at the 5% and 10% significant levels, bank size (BS) and the logarithm of internet banking (logNIB) have a positive impact on the logarithm of return asset (logROA). If all else remains the same, a 34% increase in commercial bank performance can be expected from a 1% increase in bank size. In this analysis,

the size of the banks was based on their total assets. So, it's safe to assume that commercial banks with a high ROA and a high total asset value are doing well. As a bank increases in size relative to its total assets, economies of scale will lead to a decrease in the per-unit cost necessary to reach marginal profit.

The logarithm of the logarithm of internet banking (logNIB) also has a significant impact on commercial bank profits. The financial stability of commercial banks is positively correlated with the logarithm of internet banking (logNIB). These claims are supported by the results of a study titled "Effect of E-Banking on the Financial Performance of Listed Commercial Banks in Kenya" (Fatoki, 2021). A 1 percent increase in internet banking consumers is predicted to enhance commercial bank earnings by 17.1 percent, all else being equal. In other words, commercial banks that have a significant internet banking clientele are more likely to succeed on the stock market.

Table 4.8 Robust fixed effect regression

logROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
BS	0.34	0.104	3.29	0.011	0.102	0.579	**
ME	-2.027	0.772	-2.63	0.03	-3.808	-0.246	**
logNTM	0.015	0.17	0.09	0.931	-0.377	0.407	
logNPOS	0.031	0.061	0.51	0.623	-0.11	0.173	
logNDC	0.16	0.108	1.48	0.176	-0.088	0.408	
logNMB	-0.226	0.034	-6.64	0.000	-0.304	-0.147	***
logNIB	0.171	0.09	1.89	0.095	-0.037	0.38	*
Constant	-6.297	0.909	-6.93	0.000	-8.393	-4.201	***

R-squared		Number of obs	45.000
Within	0.4368	sigma_u	1.3467136
Between	0.1213	sigma_e	0.16010461
Overall	0.0985	rho	0.98606324
corr(u_i, Xb) = -0.7417			
F-test	3.21	Prob> F	0.0004

**** p<.01, ** p<.05, * p<.1*

F test that all u_i=0: F(8, 29) = 78.87 Prob> F = 0.0000

Source: STATA output, *Robust fixed effect regression*

5. Summary and Conclusion

5.1 Summary

The purpose of this research was to look into how using electronic banking has affected Ethiopia's commercial banking sector. Different empirical studies have been undertaken with regards to electronic banking and the performance of commercial banks; this study has discovered its own gaps from these investigations. The conflicting findings about the influence and effect of electronic banking on bank performance prompted the researchers to conduct this study. Therefore, this research has gathered its own empirical evidence on how electronic banking affects the efficiency of commercial banks. The research has attempted to disentangle the effects of electronic banking's various components—ATMs, mobile banking apps, debit cards, the web, and POS terminals—because each component has its own unique characteristics. The study used a panel data design to accomplish its goals. Over the years 2018–2022, nine different commercial banks were taken into account as the analyzing unit. In order to analyse the data, this study adopted a quantitative methodology. Due to the study's use of panel data, different possible panel data models were used, including pooled ordinary least squares (POLS), random effects (RE), and fixed effects (FE). This research examined a number of models for static panel data, but through the use of many tests, it settled on a fixed effect as the best fit. The fixed effect regression model reveals a negative and statistically significant relationship between managerial efficiency and mobile banking's impact on the performance of commercial banks as evaluated by return on assets (ROA). However, heteroskedasticity was found to exist in the study's fixed effect model. The researchers in this work took corrective action for the effects of heteroskedasticity by employing a robust fixed effect model. Managerial effectiveness, the logarithm of internet banking (logNIB), bank size, and mobile banking all play a role in the bank's return on assets (ROA), as shown by a robust fixed effect model.

5.2 Conclusion:

This research aimed to provide commercial banks in Ethiopia with some recommendations based on empirical data. The report concludes with the following key recommendations:
The electronic banking systems of commercial banks warrant rigorous monitoring and management. And in particular, banking on the go. The results of this study indicate that using mobile banking negatively impacts financial outcomes for consumers. Commercial banks' financial results have worsened as the number of mobile banking users has increased. To improve commercial banks' bottom lines, mobile banking must be implemented and maintained for customer satisfaction's sake. Internet banking has a positive effect on the performance of commercial banks, so they should offer more of it to their consumers. Despite the fact that ATMs, POS systems, and debit cards have only a small beneficial impact on commercial banks' bottom lines, these institutions would do well to offer these conveniences to their customers.
The managerial effectiveness of commercial banks should be reevaluated. Their efficiency as managers has hampered their success. This indicates that they are losing money on their operational costs. As a result, they need to find ways to cut their operational costs or their costs per unit sold. To boost their bottom lines, commercial banks should increase their total assets. The results of this study suggest that large commercial banks (those with a high total asset) perform better than their smaller counterparts. As a result, smaller banks would do well to grow their total assets. The paper concludes by encouraging other scholars to investigate electronic banking in Ethiopia, which is mostly unexplored despite its rapid growth and development. Researchers are encouraged to broaden their scope by considering additional factors, such as CBE birr, Hello Cash, Amole, and agent banking. In addition, the findings might be more illuminating if qualitative data were included in future studies. Commercial banks' performance, as measured by return on asset (ROA), is negatively impacted by the logarithm of mobile banking and management efficiency, according to the fixed effect model. ROA is positively and significantly impacted by bank size and the logarithmic prevalence of internet banking. For this reason, commercial banks could benefit from reevaluating certain of their electronic banking offerings, especially mobile banking. Based on the findings of this research, commercial banks in Ethiopia should keep a careful eye on and manage their electronic banking systems, especially mobile banking, in order to boost their financial results. It also recommends that commercial banks increase their overall assets, internet banking services, and managerial efficiency to boost their financial results. Given the novelty and rapid development of electronic banking in Ethiopia, the author concludes by encouraging more scholars to investigate the topic.

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