Effect of Economic Digital Tools on the Growth of Micro-Finance Institutions in Nigeria

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Being a M.Sc. Thesis Submitted to the Department of Economics, Faculty of Management and Social Sciences, Lead City University, Ibadan, Oyo state, Nigeria

In Partial Fulfillment of the Requirements for the Award of Master of Science (M.Sc.) Degree in Economics

2022

Certification

This is to certify that this thesis titled "Effect of Economic Digital Tools on the Growth of Micro-Finance Institutions in Nigeria" was carried out by Adindu Paulinus NJOKU with Matriculation number of LCU/PG/00001768 in the Department of Economics, Faculty of Management and Social Sciences, Lead City University, Ibadan, under my supervision and that this work has not been previously submitted.

…….. ……

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Dedication

This research is dedicated to God Almighty, the Father of Light who has made it possible for me to complete this programme successfully.

Acknowledgements

My utmost thanks go to God Almighty for all he has done for me. He gave me all the requisite wisdom, knowledge, understanding, zeal, vigour and good health to successfully commence and complete my research project. To him be all glory, power, majesty, honour, dominion and praise from now to the end of the world (Amen).

I also thank my supervisor Dr. Olorunfemi Alimi for his quality supervision of the project work and for his creative suggestions and good atmosphere created in order to make this project a huge success. He assisted me in getting through this project by way of his correction, guidance, advice and encouragement that were indispensable to enhance quality research work.

I also want to appreciate the Dean of faculty Professor Omolara Ayotunde Campbell for her motherly advice and her contribution towards this research work. I also want to appreciate the entire Post graduate school for the smooth running of the programme. May God continue to strengthen and empower you all. Also to all the lecturers in the Department of Economics, Faculty of Management and Social Sciences, a very big thanks for all your support. You all made my stay worthwhile.

My heartfelt gratitude goes to my lovely wife who is my special personal assistant (SPA) for your support, sacrifice, prayers and encouragement during this project research and at all times. I pray that the Almighty God will continually sustain and prosper you in your entire endeavour in life. Thanks for your support. Also to my wonderful children, you are my motivation, thank you for always keeping me on my toes and bringing out the best in me.

To my extended family you have all enriched me in many ways and I will like to say thanks over and over again. Finally, I humbly bow and say thanks a million to God Almighty for his benevolence towards me.

Abstract

Digitization of microfinance institutions has emerged as the new wave and these institutions are persistently working on technology advancement to enhance efficiency and effectiveness in every economy. This study investigates the effects of digital economy tools on selected micro-finance banks' growth (regarding profitability, deposit mobilization, bank branches, and loan disbursement) in Nigeria over the periods of 2011 to 2020. Using the panel fixed effects estimator, automated teller machine has a negative and significant impact on return on assets and return on equity which were used as measurements of microfinance bank profitability in Nigeria. Online banking significantly and positively direct return on assets, whereas, internet banking directly and significantly impact return on equity. For point of sale and agent banking, their impacts on financial profitability of micro-finance banks are not statistically confirmed. The study showed that point of sale positively and significantly deposits mobilization which is measured by total deposit and depositors per staff. However, agent banking has a negative effect on deposit mobilization within the periods understudy. Internet banking and automated teller machine have no significant impact on deposit mobilization of microfinance banks in Nigeria. Point of sale, agent banking and automated teller machine positively influenced microfinance bank branches in Nigeria. Meanwhile, point of sale and internet banking had positive impact on loan disbursement of microfinance banks in Nigeria. However, agent banking and online banking negatively affect loan disbursement of microfinance banks in Nigeria. On policy front, microfinance institutions need to revise their digital tools procedures and policies to increase their deposit, loan disbursement and profit. Also, the government has to intervene and support their digital economy tools operation so as to make them financially viable and strong to improve the growth of microfinance banks.

Keywords: ATM, internet banking, point of sale, agent banking, online banking, profitability, deposit mobilization, bank branches, loan disbursement.

Word Count: 285.

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Chapter One

Introduction

Background to the study

Poverty exposes the poor to unfavourable, unbearable and uncontrollable circumstances, restricting them to avail services from formal banking sector. The imminent need for providing the required financial services to needy in order to ensure improvement in standard of living through an organized sector gave birth to microfinance[1]. Microfinance institutions play significant role in the development of nations in general and global poverty is one of the obstacles governments and international organizations have been struggling with so far. A person or family is usually defined as "poor" if their resources fall below a particular level or threshold of 1.9 USD. Countries with these prevailing cases are majorly found in Africa,Asia, Middle East and South America. As a way to reduce poverty, microfinance is considered the most powerful instrument for reducing poverty and improving the quality of life in developing countries. Both cross-country research and country case studies provide overwhelming evidence that rapid and sustained growth is critical to making faster progress towards this and not just the first goal of halving the global proportion of people living on less than $1 a day[2].

In Nigeria, past governments at various levels introduced a number of publicly-financed micro/rural credit programs, schemes and policies targeted at the poor. These include: rural banking program, sectoral allocation of credits, concessionary interest rate, and the agricultural credit guarantee scheme (ACGS). Government also established institutions like Nigerian Agricultural and Co-operative Bank Limited (NACB), the National Directorate of Employment (NDE), the Nigerian Agricultural Insurance Corporation (NAIC), the Peoples Bank of Nigeria (PBN), Family Economic Advancement Program (FEAP), Nigerian

Agricultural Co-operative and Rural Development Bank Limited (NACRDB) to enhance the provision of finance to the agricultural sector. National Poverty Eradication Program (NAPEP) was also created with the mandate of providing financial services to alleviate poverty. Other policies/measures introduced to stimulate economy in addition to the microfinance programs include Operation Feed the Nation (OFN), Green Revolution, Petroleum Trust Fund (PTF), Better life for the rural dwellers and the Community Banks(CBs) which was a specific target to the poor.

The short coming and failure of community banks led to the introduction of Microfinance Banks (MFB) in Nigeria. For efficiency and effectiveness and in line with regulations, the Central Bank of Nigeria (CBN), established three categories of Microfinance Banks: Unit, State and National MFBs: a Unit Microfinance Bank is authorized to operate in one location. It is required to have a minimum paid-up capital of₦20 million and is prohibited from having branches and /or cash centres, State Microfinance Bank is authorized to operate in one State or the Federal Capital Territory (FCT) and is required to have minimum paid-up capital ₦100 million and it is allowed to open branches within the same State or the FCT, subject to prior written approval of the CBN for each new branch or cash centre. The National Microfinance Bank is authorized to operate in more than one State including the FCT. It shall be required to have a minimum paid-up capital of ₦2 billion and is allowed to open branches in all States of the Federation and the FCT, subject to prior written approval of the CBN for each new branch or cash centre[3].

According to CBN reports on MFBS, from 2005 to date, a large number of MFBs have liquidated for non-performance. In 2010 alone, 224 MFBs were liquidated, based on the statistics gathered by the CBN in 2011 and in 2014, another 83 MFBs licenses were withdrawn out of 900 existing[4]. Financial growth can generate virtuous circles of prosperity and opportunity. This may lead to the emergence of a strong and growing group of

entrepreneurs, which should generate pressure for improved governance. Strong economic growth therefore advances human development, which, in turn reduces poverty. But under different conditions, similar rates of growth can have very different effects on poverty, the employment prospects of the poor and broader indicators of human development. The extent to which growth reduces poverty depends on the degree to which the poor participate in the growth process and share in its proceeds[5].

A successful strategy of poverty reduction must have at its core, measures to promote rapid and sustained economic growth. The challenge for policy is to combine growth promoting policies with policies that allow the poor to participate fully in the opportunities unleashed and therefore contribute to that growth. This includes policies to make labour markets work better, remove gender inequalities and increase financial inclusion. Asian countries are increasingly tackling this agenda of 'inclusive growth'. For instance, the India's most recent development plan has two main objectives: raising economic growth and making growth more inclusive, policy mirrored elsewhere in South Asia and Africa. Future growth will need to be based on an increasingly globalised world that offers new opportunities but also new challenges as it is known, new technologies offer not only 'catch-up' potential but also 'leapfrogging' possibilities[6].

Innovation or new science offers better prospects across both productive and service sectors just as future growth will also need to be environmentally sustainable. Improved management of water and other natural resources is required, together with movement towards low carbon technologies by both developed and developing countries. With the proper institutions, growth and environmental sustainability may be seen as complements, not substitutes. Government through inclusive growth and a number of programmes have continued to spend heavily on technology towards inclusive growth, which have a major impact on poor people's ability to take part in growth opportunities[7].

Digital technology is considered highly impactful on persons considered to be poor since they cannot afford some basis needs such as food, shelter, clothing, education, health services and good drinking water. But ultimately the biggest determinants of growth in a country will be its leadership, policies and institutions both financial and non financial. Scholars noted that one of the primary causes for poor people to remain in extreme poverty is their inadequate or very limited access to financial services. This problem has further become more severe in many developing countries due to the inadequate digital financial tools which have reduced the outreach of the poor to financial credit[8]. The World Bank Group and a broad coalition of partners – including multilateral agencies, banks, credit unions, card networks, microfinance institutions and telecommunications companies – issued numeric commitments that will help promote financial inclusion and achieve universal financial access by the year 2020. Microfinance is seen as an opportunity for individuals and businesses to access useful and affordable financial products and services in a responsible and sustainable way[9].

Microfinance is a type of banking or financial service provided to unemployed or low-income individuals or groups who otherwise would have no other access to financial services. Microfinance allows people to take on reasonable small business loans safely and in a manner that is consistent with ethical lending practices[10]. The World Bank estimates that more than 500million people have benefited from microfinance-related operations. While microfinance involves supplying financial services and products to disadvantaged populations that are excluded from the traditional banking system, the origin can be traced slowly to Bangladesh, in the village of Jobra. Before transforming into the global economic activity it has become today, its originator Muhammad Yunus in 1970 said “liberates people’s dreams and helps the poorest of the poor to achieve dignity”. What happened in Jobra could have remained an isolated incident, but Muhammad Yunus was determined to replicate this first microcredit experience elsewhere. After receiving a lukewarm reception from the banking system, he

decided to create his own program: Grameen[11]. The Grameen system turned traditional banking on its head. It offered small loans to poor populations, with no financial guarantees required in return. It also ushered in the principle of joint responsibility, which involves solidarity between the members of beneficiary groups. Finally, the program targeted women, who had been traditionally excluded from the financial system. Though it was a bold gamble, the program was an immediate success[11]. Grameen Bank known as the "Bank for the poor" was thus born and would soon record stunning growth. The bank opened many new "branches", which are now present in over 80,000 villages. Estimates suggest that the bank has extended credit access to over seven million beneficiaries in Bangladesh, 97% of whom are women. The 1980s and 1990s saw the model exported around the world through the intermediaries of NGOs and financial institutions. Soon a full-fledged microfinance industry emerged in developing countries. Many other institutions gradually expanded the global microfinance network: dozens of microfinance institutions (MFIs) set up shop in Nigeria; LAPO, KUDA, ACCION, Mutial Trust, Fina Trust, AB, VFD Microfinance Banks etc. The early 21st century marked the international rise of microfinance. While the first microfinance summit took place in Washington in 1997, the G8 outlined the principles of microfinance in 2004, tracing the contours of a new economic sector[12].

Microfinance which can be explained as access to formal financial services such as credit, savings and insurance opportunities is still very vague in Nigeria where there is high level of poverty. Nigeria has a large number of unbanked 'people whose business activities are not captured in the country's economic reports[13]. These unbanked populaces are illiterates who are either unemployed or under-employed and lack access to financial services and information and are totally excluded in the financial ecosystem and market. Microfinance plays significant role in the reduction of poverty in Nigeria, this includes providing financial services through both Government and private financial institutions using various mobile

initiatives such as mobile banking, mobile money, agent banking, Point of sales (POS) etc. as economic digital tools to stimulate poverty reduction. The unbanked in Nigeria are low income people who do not have access to financial services and information while few are timid on the need to use financial services, many of them are willing to use these services and believe the availability of these services will help improve their economic condition. Among the microfinance banks available in Nigeria, the predominate Microfinance institutions in Nigeria include Lift Above Poverty Organisation (LAPO), Grooming Centre, Self reliance Economic Advancement programme (SEAP), Accion, AB Microfinance, Advance Lafayette, these Microfinance institutions control over 80 percent of the market share out of over 1000 Microfinance institutions in Nigeria[13].

The number of studies and the analysis of the government policies regarding Microfinance highlighted as an effective instrument in enabling the access for the unbanked and underserved people to financial resources living in a cash economy and being left out of the formal financial system are vast[9]. This means providing more channels to render services in more efficient and safe ways to create opportunities for growth in any economy. Access to a simple, secure digital account is far more than a convenience. It can mean transparency in getting clients to build savings and gain access to credit, or safely move funds without too much cash risk and theft[8].

It is important to note that the aim of the microfinance bank is to ensure adequate provision of financial credit products to specific groups at the lower end of the market, using specific delivery techniques and institutions[14]. The evolution and recent developments in Information Communication Technology (ICT) have introduced sophisticated technology that is based on automation and interconnection of computers and other electronic devices to carry economic activities[15]. They are known as Digital Economic Tools of Digital Financial Tools. Digital business operations which are the application of computer technology to banking operations

constitute one aspect of the ICT[16]. The perception is that these channels have led to easy and fast means of information collection, storage, retrieval, processing, transmitting and distribution of information which invariably increased banks performance[17]. As at first quarter of 2019, the more frequent ICT tools in vogue in Nigeria Micro Finance banks are Automated Teller Machine (ATM), Point of sales (POS), Mobile banking (MB), Internet banking (IB), and online banking (OB). Meanwhile, there have been waves of arguments and non-consensus by scholars on whether ICT has effectively or ineffectively played catalytic role in boosting banks' performance and financial inclusion[18].

Statement of the Problem

Microfinance institutions are engines of economic development of nations in general and developing countries in particular. One of the challenges microfinance currently faces in Nigeria is means for the MFIs to reach a greater number of the poor. Another challenge is that most of microfinance funding goes to the commercial sector to the detriment of the more vital economic activities, due to the unwillingness or inability of commercial banks to provide financial services to the urban and rural poor, coupled with the in-sustainability of government-sponsored development financial institutions and programs, most micro entrepreneurs still access financial services from informal.

The challenge of most microfinance is how to move funds from informal to formal economy. Microfinance institutions are engines of economic development of nations in general and developing countries in particular, however, the challenges of most Microfinance is how to move funds from informal to formal economy sources, including savings and credit associations, traders, or moneylenders. Semi-formal and formal providers of Microfinance are a small but rapidly growing part of the financial sector in Nigeria with a handful of large, microcredit NGOs and Microfinance banks providing the bulk of services[19]. These arguments have necessitated research questions such as: Has the application of economic digital tools (e-

channels) increased and improved significantly Micro Finance banks performance? Has there been significant improvement in financial inclusion since the emergence of e-banking in Nigeria? Also, with the banks increasingly inter connect of their computer systems across their branches in different geographical locations with high speed network infrastructure with local areas and wide area networks internet connections, has this led to improved bank performance?

Interest rate on loan is one of the factors that have mitigated the performance of microfinance banks in Nigeria. A notable scholar mentioned that interest rates in the microfinance institutions are much higher than the prevailing rates in the banks[20]. Given the fact that people borrowing at this rate indicate that they are industrious and productive, it is only that they are not given access to low financial credit, because they do not have collateral to meet the requirements of formal financial institutions and then they remain poor and liabilities to the economy instead of being assets. Also, the objective of Microfinance to combat poverty might be defeated since the clients have to repay back double of what they have received at all cost[20].

Furthermore, the conventional Micro financing in Nigeria aggravates the inequitable distribution of income and wealth in Nigeria. This is due to the fact that while interest rate on borrowing from microfinance institutions ranges from 30% to 100% per annum. Moreover, the current Micro financing in Nigeria gives loan to commerce based activity to the detriment of agriculture based which is the source of income and sustenance for the majority of poor Nigerians. In a study conducted by CBN on the major ten MFIs in Nigeria, it was found that the loan disbursement goes to the trade and commerce because of its fast yield and high return[21]. The average loan on this sector was 78.4%. The corresponding figure on agriculture which most poor rely on for their lively hood was only 14.1%. It was only 3.5% on manufacturing and absolutely no funding is given towards housing and consumption[21].

The Central Bank of Nigeria's estimate that unreachable client of Microfinance reaches 40 million in 2004[22]. Microfinance specific institutions in Nigeria have not been able to adequately address the gap in terms of credit, savings and other financial services required by the micro-entrepreneurs. In 2005, the share of micro-credit as a percentage of total credit was 0.9%, while it contributed a meagre 0.2 percent of the GDP[21]. The dominant Microfinance institutions are concentrated in the South-West and South-Eastern part of the country to the detriment of poor majority in the predominantly Muslim North. The incidence of poverty in the three Northern regions is high compared to the three Southern regions. It was 71% in North West, 72% in North East and 67% in North Central[23]. The corresponding figure in the South is 43% in South West, 23% in South East and 35% in the South[23]. These numbers are what led to the conclusion that very high level of poverty is essentially a Northern Phenomenon[23].

Research Questions

The study provides answers to the following research questions:

a) What is the effect of digital economy tools on the business profitability of micro-finance banks regarding their return on assets and return on equity in Nigeria?
b) To what extent do digital economy tools influence the deposit mobilization of micro-finance banks in Nigeria?
c) How have digital economy tools contributed to the numbers of micro-finance bank branches in Nigeria?
d) What is the impact of digital economy tools on loan disbursement of micro-finance banks in Nigeria?

Objectives of the Study

The broad objective of this study is to examine the effect of digital economy tools on the growth of selected micro-finance institutions in Nigeria. The specific objectives are to:

a) determine the effect of digital economy tools on the business profitability of micro-finance banks regarding their return on assets and return on equity in Nigeria;
b) examine the impact of digital economy tools on deposit mobilization of micro-finance banks in Nigeria;
c) evaluate the effect of digital economy tools on micro-finance bank branches in Nigeria; and
d) To investigate the impact of digital economy tools on loan disbursement of micro-finance banks in Nigeria.

Hypotheses

The following null hypotheses are addressed in this study:

$H_0$1: Digital economy tools have no significant effect on the business profitability of micro-finance banks in Nigeria.

$H_0$2: There is no significant relationship between digital economy tools and deposit mobilization of micro-finance banks in Nigeria.

$H_0$3: Digital economy tools have no significant effect on the micro-finance bank branches in Nigeria.

$H_0$4: There is no significant relationship between digital economy tools and loan disbursement of micro-finance banks in Nigeria.

Significance of the Study

Microfinance globally has been recognized among governments, researchers and economic observers as an important tool for poverty reduction, employment generation, wealth creation and improving welfare and standard of living of people and in turn economic development. The concept has gained momentum in recent times because of its now obvious impact on poverty alleviation which is important to the economic growth of the country. This is due to the realization by the government that as more people enter the financial system, the lesser the amount of money left outside the system which can help to boost investment in theeconomy.

This work contributes to the on-going research in support of financial inclusion as an effective solution for growth and poverty reduction in developing nations which Nigeria is not an exception. Insights from this work can provide national and global policy makers with an understanding of the issues associated with the rapid development of digital financial services, its delivery and the risks involved in the use of digital tools and digital financial inclusion. Academics and researchers may further discussion in this work to the emerging financial inclusion literature that attempt to proffer solutions to achieve sustainable financial inclusion particularly in poor economies like Nigeria.

Studies opined that no economy can grow on the whole if large parts of its population are not covered by the financial system as they are the real economic pillars[17,18,19,24,25]. They also noted that access to financial services is a useful tool that the government can employ in stimulating and accelerating economic growth with efficient distribution of available resources, thereby leading to decreased capital cost[13]. The Global Partnership for Financial Inclusion and Alliance for Financial Inclusion have pushed the belief that Microfinance is achieved and defined differently in each distinctive circumstance.

Scope of the Study

This research intends to examine the effect of digital financial tools on the performance of selected microfinance banks within the scope of 2011 and 2020. The selection of the microfinance banks were based on those with the highest market capitalization. Among the microfinance banks in Nigeria, the predominate Microfinance institutions in Nigeria include Lift Above Poverty Organisation (LAPO), Grooming Centre, Self reliance Economic Advancement programme (SEAP), Accion, AB Microfinance, Advance Lafayette, ASHA Microfinance, BAOBAB Microfinance, LA Fayette Microfinance, LETSHEGO Microfinance, NIRSAL Microfinance, and NPF Microfinance with control over 80 percent of the market share out of over 1000 Microfinance institutions in Nigeria[13]. The microfinance banks with national coverage are also considered in the study. Owing to the period under concern, the macroeconomic performance of all economies was affected during the Global Financial crisis, which introduced remarkable fluctuations in economic performance of financial industry.

Operational Definition of Terms

Agent Banking: This is an arrangement that allows retail outlets serve as representative of Standard Chartered Bank to offer basic banking services to customers as defined by agency banking guidelines.

Digital Economy: It is the economic activity of a nation or country that results from billions of everyday online connections through the internet and the World Wide Web among people, businesses, devices, data and processes.

Digital Economy Tools: This includes a broad range of financial service tools like point of sales, internet banking, agent banking, and mobile money etc. used to access and deliver financial services such as payments, credit, savings, remittances and insurance.

Internet Banking: This means accessing your bank account and carrying out financial transactions through the internet on your smart phone, tablet or computer. It's quick, usually free and allows you to do tasks, such as paying bills and transferring money, without having to visit or call your bank.

Microfinance Banks: They are financial institutions that provide vital financial services like daily contribution, savings, lending, domestic fund transfer etc. to the unbanked individuals, under-resourced group and low income earners.

Microfinance Performance: It measures the growth of financial services of microfinance banks in terms of deposits, number of branches, borrowers per staff, depositor per staff and profitability.

Mobile Money: It refers to payment services operated under financial regulation and performed from or via a mobile device. Instead of paying with cash, cheque, or credit cards, a consumer can use a mobile to pay for a wide range of services and digital or hard goods.

Point of Sales: It refers to the place where customers execute payments for goods or services. POS systems provide companies with sales and marketing data.

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Chapter Two

Literature Review

Conceptual Review

Digital Economy and Digital Economy Tools

Digital economy refers to activities and transactions driven by the public and private sectors as well as the citizens to produce, adopt and innovate digital technologies and services in relation to socio-economic functions for enhanced wealth creation, productivity and quality of life. The digital economy is an economy that is based on digital computing technologies but is often perceived as conducting business through markets based on the internet and the World Wide Web[1]. It is also known as the Internet Economy, New Economy, or Web Economy. The digital economy is intertwined with the traditional economy, making a clear delineation harder. The digital economy results from billions of everyday online connections among people, businesses, devices, data, and processes. It is based on the interconnectedness of people, organizations, and machines that results from the Internet, mobile technology and the internet of things. Without the Internet, the digital economy that the global economy runs on would not exist in its current form[2].

The digital economy is backed by the spread of information and communication technologies (ICT) across all business sectors to enhance its productivity. Digital transformation of the economy is altering conventional notions about how businesses are structured, how consumers obtain goods and services, and how states need to adapt to new regulatory challenges. The future of work, especially since the COVID-19 pandemic, is also contributing to the digital economy[3]. More people are now working online, and with the increase of online activity that contributes to the global economy, companies that support the systems of the Internet are more profitable[4].

The Digital Economy which also referred to as the New Economy means an economy in which digital computing technologies are used in economic activities. The three main components of the digital economy concept are: (i) E-business infrastructure (hardware, software, telecom, networks, human capital, etc.), (ii) E-business (how business is conducted, any process that an organization conducts over computer-mediated networks), and (iii) E-commerce (transfer of goods, for example when a book is sold online)[5].

In this new economy, digital networking and communications infrastructure provide a global platform on which people and organizations devise strategies, interact, communicate, collaborate, and search for information. More recently, "digital economy" is defined as the branch of economics studying the movement of "zero marginal cost intangible goods" over the Internet[6]. The definition of digital economy is not harmonized across governments, businesses, and international organizations. According to the OECD, the digital economy can be defined in three different approaches:

a) **Bottom-up approach:** It characterizes industries' and firms' output or production processes to decide whether they should be included in the digital economy[7].

b) **Top-down or trend-based approach:** This identifies the key trends driving the digital transformation and then analyzing the extent to which these are reflected in the real economy[7].

c) **Flexible or tiered approach:** It breaks the digital economy into core and non-core components, and thereby finding a compromise between adaptability and the need to arrive at some common ground on the meaning of the term[7,8].

Microfinance Performance

Microfinance institutions are organizations that provide loans to low-income clients, including micro-companies and the self-employed, who traditionally lack access to mainstream sources of finance from Banking Institutions. The loans are typically for small amounts targeting borrowers in developing countries and usually for a short term (a year or less). The loans are not secured by collateral assets as would be the case for Banking Institutions and require repayment in weekly instalments rather than on a monthly basis. A microfinance institution's exposure to environmental and social risks is typically low. Because social development is part of their mandate, microfinance institutions are concerned with the environmental and social risks of their transactions and are taking steps to manage these risks to reduce negative impacts in their communities.

Microfinance performance refers to profitability and financial viability which means the ability of microfinance to cover operating expenses by its operating revenues. These performance indices tend to summarize performance in all areas of the industry. If portfolio quality is poor or efficiency is low, this will be reflected in profitability. Because they are an aggregate of so many factors, profitability indicators can be difficult to interpret. The fact that a microfinance has a high return on equity says little about why that is so. Two accounting indicators used in this research study are return on assets (ROA) and return on equity (ROE). On the first hand, ROA is calculated by dividing net income (after taxes and excluding any grants or donations) by period average assets. Return on assets is an overall measure of profitability that reflects both the profit margin and the efficiency of the institution. Simply put, it measures how well the institution uses all its assets. On the other hand, ROE is calculated by dividing net income (after taxes and excluding any grants or donations) by period average equity. Return on equity indicates the profitability of the institution. This ratio is particularly relevant for a private for-profit entity with real flesh-and-blood owners.

Digital Economy Tools and Microfinance Performance

There is an ongoing debate that financial inclusion through digital tools can play a pivotal role in alleviating poverty following the poverty alleviation strategies through the implementation of economic digital tools / digital finance such as Point of Sales (POS), agent banking, mobile money, and internet banking transaction platforms which have gained a huge popularity in Nigeria over the resent times[9]. Historically, bringing microfinance services to the vulnerable groups in the population is evidently a costly business process. Over the past decades, microfinance institutions have been struggling with finding and applying alternative business models to reduce costs, accelerating greater outreach to remote areas, and quickly and efficiently meeting customer financial requirements. In response to these challenges, especially during the explosive digital era, digital applications and other smart devices such as smart phones or tablets have been increasingly deployed by microfinance institutions (MFIs) to digitize core business operations, such as loan disbursement, savings and insurance[10].

There are growing arguments regarding to what extent financial inclusion through digital finance assists to improve the sustainability of the poor people and yet affect the growth of financial institutions in Nigeria. Digital finance is one of the key pillars in the microfinance innovation process toward becoming more mature and surviving in an increasingly competitive environment. Digital tools are not only an important tool for the business operation of MFIs, but also a motivation that forces a more competitive environment in the microfinance industry. Also, mobile service solutions do have positive impacts on lowering transaction and administration costs of MFIs, which subsequently helps to reduce the lending rate. From this perspective, both MFIs and their borrowers benefit from the application of mobile technology[11].

Furthermore, the IMF and the World Bank data bases on financial inclusion indicators with the view to assessing the contribution of digital finance to financial inclusion revealed that digital finance has insignificantly influenced financial inclusion. Besides, the results showed that the poor do not have access to digital financial services, and, as such, they make less use of them if compared to the middle class[12].

A study sought to find out whether microfinance through digital finance could eradicate poverty in Islamic countries and improve microfinance institutions growth[13]. The specific ways in which financial inclusion promotes income equality and reduces poverty are not clearly understood. The study established that unlike conventional microfinance, digital finance offers not only financial inclusion but also social inclusion to satisfy the basic needs of the society before credit is granted. Social inclusion here serves as a motivator to the underprivileged members of the Islamic society. Therefore, microfinance plays a significant role in eradicating poverty and support growth generally[13]. The study applied methods to ascertain the relationship between financial inclusion and the digital financial services and the effect on the growth of financial institutions. The study revealed that a lot of individuals and businesses are yet to be financially included, and cost, distance, documentation, trust and religious adherence are found to be among the major factors hindering the achievement of financial inclusion[13].

Improving access and building inclusive financial systems is a goal that is relevant to economies at all levels of development aiming to include the poorest part of the population in the financial streams [12]. It is argued that financial inclusion leads to some levels of economic development in that country and vice-versa digital finance, as it has been set in the millennium development goals (MDGs), as one of the agendas on the way to global poverty reduction[13]. A study appraised the impact of digital finance in the growth and poverty reduction in the Nigerian economy[14]. The study explores various aspects of digital tools using

the financial sector of the Nigerian economy as a focal point. Specifically, the result suggests possible ways the policy have direct links to beneficiaries and the outcomes when divergence is noticed and how to bring back the soundness, sustainable and rebranding policy that ensures economic growth. A study suggests that for a sustainable digital finance society to emerge all hands must be on deck; financial institutions should emphasize and ensure that efficiencies of digital finance mechanisms are of utmost priority[15].

Some scholars mentioned that financial inclusion is the ability of businesses and individuals to gain access to various financial services and resources in a less costly and undemanding way[16]. They further stated that financial inclusion is a significant tool that can serve for nation's economic prosperity, meaning inclusive financial systems may help access to formal financial resources that are usually affordable and less risky than informal ones[17]. Some researchers stated a point that financial inclusion is the opportunity of access to basic financial services and thus is considered an effective tool to reduce poverty and lower income inequality by highlighting financial inclusion as a tool to support poor people to increase their levels of income and perform better financially[18]. In a work, it highlighted financial inclusion as an opportunity for poor people to gain access to such formal financial services as credit, savings and insurance opportunities since financial exclusion poses some hindrances on the ability to obtain the necessary financial resources in effective time and manner, financial inclusion should be prioritized in government policy[19].

Financial inclusion in the form of access to various financial products and quality services serve as an important tool to enhance inclusive growth. What is more interesting in their finding is that financial inclusion may help to reduce the gender gap by empowering the women in business[20]. As financial inclusion encourages higher investment in the economy due to easiness in accessing credit, the barriers to financial services might have a negative impact on the competitiveness of small business subjects in Ngeria[21]. More so, financial

inclusion enhancing the quality of financial services and products offered can help to improve the overall sustainability of the financial system of the country as financial inclusion plays a significant role in providing the under-banked in remote areas with various banking services that are essential to enhance the livelihood of the society[20]. Despite the differences in methods, this is considered a means of improving the economic condition of the society and increasing the wealth of the poor.

Financial inclusion as an enabler was stated by a scholar to aid access to quality financial services in a timely manner[22]. Moreover, a study stresses the significance of the sophisticated number of access points for the people so that they can utilize these financial services quite frequently once they are in need[23]. Governments should take necessary measures to gather sufficient data regarding how quality the service is and how frequently people are utilizing the services. While studying the impacts of financial inclusion on the economic growth of Nigeria, it found out a significant positive relationship between financial inclusion and economic growth[24]. Besides, the author showed that Financial Inclusion greatly influenced poverty reduction and financial intermediation through positively impacted Bank Branch Networks, loans to rural areas and small enterprises[24].

A) Point of Sales (POS)

A point-of-sale machine is the payment device that allows credit/debit cardholder to make payment at sales/purchase outlet. It involves a computer terminal in retail stores that will transfer funds instantly from the bank deposit of the store in which customer is making purchase. The computer will confirm the sufficiency of funds in the customer's account for completion of the transaction. POS improves customer services, allows purchase and instant payments through the point of sale; discounts to allow online purchases. The utilization of the electronic payments systems will also benefit all stakeholders[25].

POS is one of the e-payment systems introduced in Nigeria to further the course of cashless policy. POS is an electronic payment device which enables individuals to make purchases with electronic cards. POS accepts ATM cards for payment of goods and services. This card stores account information on microchips. The microchip contains a purse in which monetary value is held electronically. The card can be used to make purchase of goods and services online, in supermarkets, shopping malls, and other market places. POS allows cardholders to have a real time online access to funds and information in their bank account through debit or cash cards. POS deployment is projected to hit 350,000 in 2014 from 120,191 in 2013, reflecting growing acceptance of POS and electronic card payments. This is because between 2012 and 2014, it was found that the volume of transactions conducted via POS increased by 183% compound annual growth rate (CAGR) suggesting significant adoption and usage of POS[26].

Point of Sales (POS) machine or terminal is an electronic device used in payment for goods and services. You find it in supermarkets, hotels, filling stations, shops etc. A charge known as Merchant Service Charge (MSC) is charged on all transactions done on POS terminals; this charge is borne by the merchant. The maximum total fee a merchant can be charged for any POS terminal transaction is 0.75% of the transaction value or ₦1,200.00 cap. Point of Sale refers to the location at which a payment of a card transaction occurs, usually by way of a device such as a credit card terminal or cash register. The industry has endorsed four manufacturers for the supply of Point-of-Sale terminals - PAX, Bitel, Ingenico, and Verifone - with negotiated discounts and local support arrangements. A POS can be purchased from any of these four for as low as N45,000.00 per terminal. However, parties are free to purchase POS terminals from any manufacturer; so far they meet the POS specifications in the Point- of-Sale guidelines[26,27,28].

While Micro Finance Institution have adopted POS to make services conveniently available to customers. A study argues that there are many customers still transacting with tellers within the doors of the MFI, and customers are found in queues every time in banking halls[29]. The queues develop due to system downtime and there is inefficiency in the operations since all the operations cannot run as required[57]. Most studies done on POS concentrated mainly on customers experience which reveals little of the banks crises associated to POS for example, a study on perceived service quality and satisfaction of self-service technology argued that there is a high degree of customer complaints with POS downtime, cash out, high charges and sometimes, poor service recovery efforts when customers have problems. Organizations therefore, adopt POS without certainty on the expected outcome in terms of operational performance[29].

B) Agent Banking

A banking agent is a retail or postal outlet contracted by a financial institution or a mobile network operator to process clients' transactions. Agents will provide banking services to the people on behalf of a bank and the nearest branch of the bank will provide necessary logistic support[15]. Definitely the agents will be guided by profit motive in addition to the clearly-defined roles and responsibilities for them. Rather than a branch teller, it is the owner or an employee of the retail outlet who conducts the transaction and lets clients deposit, withdraw, and transfer funds, pay their bills, inquire about an account balance, or a direct deposit from their employer[27]. Banking agents can be pharmacies, supermarkets, convenience stores, lottery outlets, post offices, and many more. Bank agents can offer a number of banking services, including cash deposits and withdrawals, fund transfers, bill payments, loan disbursement and repayments, payment of benefits and salaries, and collection of account and loan applications. However, agents are limited to cash-only transactions and cannot access applications[30].

Agent banking, also known as correspondent banking, is a model for delivering financial services to locations for which bank branches would be uneconomical. It is a delivery channel that holds high potential for closing the delivery gap. Agent banking is a branch-less banking model that allows financial institutions to use third party retail agents and leverage on ICT to provide financial services outside the traditional brick and mortar bank premises. It is opening up new windows of opportunity for financial institutions to reach out to more people, especially in remote, rural areas, while bringing down costs of operation[30].

Agent banking is all driven by technology and transactions can be made via mobile phone, a point of sale (POS) system, or internet banking, and must be reflected immediately on the bank's side in the core banking system [60]. Following the roll out of the agent banking model, deposit money banks have been able to contract varied retail entities. These entities, such as security companies, courier services, pharmacies, supermarkets and post offices act as third party agents to provide cash-in -cash-out transactions and other services in compliance with the laid down guidelines[27].

These agents differ in their mode of operations, capital/registration requirement, ownership and management, area of coverage, reporting lines and disclosures as well as control and monitoring. Establishment of an agent requires the financial institution to carry out due diligence on such firm to ascertain its suitability for such sensitive task. It also requires the financial institution to specify the permissible activities to be carried out by such agent within its category[36]. Such entity must be a legitimate or legal entity, a going concern registered and carrying on business in Nigeria for more than 12 months. The mode of operation is that the financial service providers (banks and mobile money operators) deploy agent facilities and manpower in rural communities to sell financial products and services which may include monitoring and enforcing repayment of credits on commission basis. The role of banking agents is to help deposit money banks de-congest banking halls by providing

"complementary", often more convenient channel for customers to use. Other financial institutions, especially in developing markets, use agents to reach an "additional" client segment or geography[27]. There are three categories of bank agents according to the CBN namely (i) super-agents, (ii) sole-agents, and (iii) sub-agents[30].

The Financial Inclusion Strategy Summary Report in 2012 identified agents as part of the veritable channels for driving inclusive growth in emerging economics of the world. According to the same report some of the stakeholders in pursuit of an inclusive growth agenda together with the CBN includes other financial institutions, like insurance, regulators, technology/telecommunications firms, public institutions and development partners/experts. In order to empower the various agents licensed by the Central Bank, reduce cost of service or product delivery, expand geographical coverage, and achieve high inclusive economic growth, there is need to collaborate with mobile money operators as well as technology and telecommunication firms[27]. The CBN operating manual for the control of agent banking and its relationship with other stakeholders defined an agent as "an entity that is employed by a financial institution to offer specific financial services on the behalf of its principal using the agent's facilities". Enhancing Financial Innovation Access (EFIA) defined agent banking services as "the provision of financial services independent of the usual bank branches, frequently using nonbank retail agents and depending modern technologies such as card reading, point-of-sales (POS) terminals or mobile phones for on-line real time transaction processing[26]. A banking agent as a retail or postal platform is engaged by a licensed deposit money bank or a mobile money operator to offer a variety of services to customers[28].

According to the National Financial Inclusion Strategy (NFIA) summary report in 2012, the CBN as financial system regulator in Nigeria has recognized financial inclusion as a major window to accomplishing its objectives of inclusive growth under its mandate. In view of this, the apex bank is determined to establish a financial inclusion strategy that is

implementable and accomplishable. Promoting and encouraging inclusive growth through agents will assist the CBN in achieving its core mandates[32].

Agent banking presents various benefits for the banks, for the customers, for the agents and for the country in which it is practiced. First and foremost, agent banking allows financial institutions to establish physical presence in rural areas, remote areas or low population density where the cost of opening a branch may not make business sense. Secondly, it allows customers to access financial services in a more familiar way than in a branch as the unbanked are not familiar with the procedures of a traditional bank branch. Thirdly, it increases the sales from customers seeking banking services while increasing the income source for the agents through the commissions or fees they get from banks. Last but not least, agent banking contributes to a more efficient and inclusive financial system by extending financial services to a wider population[15,33].

C) Mobile Money

Mobile money is one of the financial services that are offered through mobile phones[34]. Mobile money was first developed in Kenya by mobile phone operator, Vodafone, and was launched commercially by its Kenyan affiliate Safaricom in March 2007. The World Bank Group is well positioned to support the growth of mobile money, and the industry has grown significantly in size and scope since the First Mobile Money Summit held in May 2008 in Cairo, Egypt[34]. Arguably, Mobile financial services are among the most promising mobile applications in the developing world due to its ease of operation. Some studies noted that mobile money transforms nation's economy, as it is accepted across commerce, health care, agriculture, and other sectors[35,36].

Furthermore, a study posited that financial services that are provided through mobile phone technology have multiple configurations, goals, and characteristics, which distinguished it

from another[37]. The authors went further to state that the differences depend on the combination of agents, technologies and objectives; if they have banking features, they are called mobile banking; if they have transaction payment features, they are recognized as mobile payments; and if they replicate the concept of money with digital features, then they are called mobile money. Therefore, mobile money is money with digital features[37].

The development in information technology in recent age has forced many banks and financial operators to upgrade with different innovative products, which differentiate and makes access to financial services easier. Some of these innovations are; Automated Teller Machine (ATM), online Internet Banking, Mobile Banking, Mobile Payment and recently Mobile Money. The cashless programme of Central Bank of Nigeria (CBN) is designed to reduce the circulation of money in the country by enabling people pay for goods and services without need for cash[38]. This policy has created some concern about mobile money application in Nigeria. An institute posits that the provision of financial services through mobile phone are efficient and most effective means of including the large number of population that do not have formal bank account into banking services[39,40]. Thus, it will assist in boosting the domestic savings and the country's revenue. Equally, the World Bank president (July 2007 – June 2012), said that providing financial services to the 2.5 billion people who are unbanked could boost economic growth and opportunity for the world's poor[41]. Furthermore, studies on M-PESA in Kenya found that four out of five M-PESA users believe that not having access to M-PESA's services would have a "large negative impact" on their lives. It was further posited that users M-PESA see it as being faster (98%), more convenient (97%), and more secure (98%) than other methods that are often use in sending or receiving money[30].

Therefore, the presence of mobile phones in Nigeria environment should be an avenue for the introduction of mobile money, which will boost economic growth. Although, an institute

stated that respondents who are not registered with any mobile money operators (MMO) were because of lack of information (29%), safety issues/concern with security of account information (27%), reliability issues/concern with effective transaction processing (23%) and a lack of interest/need for the service (17%)[39]. Other reasons they gave for non-usage of mobile money include "Problems with network service providers" and "Insufficient funds to warrant use" but our study looked at factors from the developed theoretical perspective. Literature on the acceptance of mobile money in Nigeria is very scanty and no study has been conducted in Nigeria with regard to the acceptance of mobile money using technology acceptance model. Most of the researchers concentrate on adoption of mobile or internet banking[37].

Nigeria is one of the developing countries that have managed to increase financial inclusion exponentially using the non-bank financial service - mobile money that is provided by Mobile Network Operators. Unbanked and low-income people have been the main beneficiaries of mobile money service. Therefore, this thesis aims to explore the effect of economic digital tools in Nigeria which mobile money is one of such tools and give policy recommendations to the further literature based on the growth of Micro finance. It should be noted that there are similarities in key growth indicators in MFI, such as Branch expansion, number of staff and amount of deposit mobilized be staff. Another significant point is high mobile phone penetration rates (approximately 80%) in Nigeria that allows the MFIs to include financially excluded population of the society into formal financial services in an affordable and fast way via mobile devices[42].

D) Internet Banking

Internet banking as an internet portal, through which customers can use different kinds of banking services ranging from bill payment to making investments. It is an electronic payment system that enables customers of a bank or other financial institution to conduct a

range of financial transactions through the financial institution's website via electronic devices like mobile phones, Ipads, laptops, Desktops etc. right at the comfort of their homes, offices and other places of convenience. Internet banking uses electronic card infrastructure for executing payment instructions and final settlement of goods and services over the internet between the merchant and the customers)[40]. Internet banking gives customers the opportunity of enjoying banking services from the comfort of their homes and offices. This means that customers can buy goods by placing orders from the net, instruct their banks to pay the vendor the invoice amount involved, and the products are delivered to the destination where the buyer wants[40].

Internet banking is the main vehicle for Public Access Computing (PAC). Internet banking offers an excellent environment for banks to experiment with the delivery of home banking. It has been used to develop virtual reality bank branches in the United States of America[43]. A prototype of this is the Electronic Courtyard developed by the Global Payment System Visa and the US software firm worlds Inc. It allows customers to check account balances, transfer funds and apply for loans. It uses three-dimensional graphics to enable customers to move into different rooms and communicate with virtual bank tellers, loan arrangers and financial advisers. It uses visa remote banking subsidiary, visa interactive, to link banks with customers and provide secure technology for the safety of account data transferred[43].

Internet Banking refers to the use of the internet as a delivery channel for banking services, including traditional banking services such as balance enquiry, printing statements, fund transfers to other accounts and bill payments. IB is defined as web-based banking, where bank customers can interact with and obtain a bank's financial services (both informational and transactional) in a virtual environment using any device connected to the internet[44]. Internet banking services covered include online funds transfers, loan applications via the internet, online account balance and statement, automatic payroll deposits, bill payments,

airtime purchases, cheque confirmation, salary advance request, investment, standing order, foreign exchange transactions, among others[40].

The continuous advances in the internet technology have brought a great impact on business operations and have in particular brought about a paradigm shift in banking operations in Nigeria. The Nigerian Micro finance industry has gone through reforms which have left the country stronger and reliable Micro Finance institutions than it has in the past 12 years. This reform brought about a radical change in the way financial activities is conducted in Nigeria. In line with the reforms and in the bid to catch up with global developments, improve the quality of service delivery and reduce transaction cost associated with manual financial operations, Micro finance Institutions in Nigeria have transformed from manual to automated systems, by joining their counterparts in other parts of the world to invest greatly on ICTs that make IB possible. Presently in Nigeria, IB is one of the services being offered by all Nigerian financial institution[40,45].

Furthermore, internet banking services deliveries are considered the cheapest, most profitable and wealthiest delivery channel for financial products. But it is important to know that the success of internet banking adoption is not in the hands of government and banks alone, but relies to a great extent on customers because the customers have great influence on any technology that is brought forward by the financial institution. This is a strategy for economic growth through financial penetration into under severed communities with availability of internet service by mobile network providers with resident who are technology savvy. Studies have shown that the young people are more enthusiastic about adoption of new technology, however, it was observed that, even with access to the internet and ICTs, some persons are yet to adopt the use of internet banking for their banking transactions. They often visited the internet for social networking, chatting, sending of mails and pictures, but were found

queuing inside the banks for their banking transactions. This still poses some questions on their confidence level towards this technology[46].

A study explained that internet banking or electronic banking (e-banking) enables bank customers to access accounts and general information on bank products and services through the internet[47]. This can be at the comfort of their homes or offices. However, banking through internet has emerged as a strategic resource for achieving higher efficiency, control of operations and reduction of cost by replacing paper based and labour intensive methods with automated processes thus leading to higher productivity and profitability[46]. However, to date researchers have produced little evidence regarding these potential changes. Nonetheless, recent empirical studies indicate that Internet banking is not having an independent effect on banking profitability, although these findings may change as the use of the Internet becomes more widespread. Internet banking in banks ensured that performance of banks improved more than when banks were using traditional system of banking in the organization. The introduction of internet banking in the bank ensures that banks operate at a cheaper cost, have 24 hours internet service availability as well as encourage ICT competence of customers in order to realized high performance in terms of organizational effectiveness, efficiency and business expansion which are potentials to improve productivity, growth and profitability performance of banks due to low cost advantages associated with the delivery of its service[46,47].

Digital Finance is one area of microfinance that many households in developing countries lack access to and as a result let economic opportunities slip by. Policymakers have attempted to expand lending/credit physically, by either duplicating institutions available in rich countries (bank branches and credit bureaus), or by developing new ones. But physical interaction is costly for small loans in remote populations. Current approaches have left many excluded two billion people around the world still lack bank accounts, according to the World

Bank[14]. But recent innovations have made possible a potentially transformative new model: digital credit delivered directly via mobile phones. Digital finance has become possible because of three recent innovations. Mobile phones, first adopted for person to person communication, also represent a platform that can connect developing country consumers with digital services. Mobile money builds on this platform, dramatically reducing the cost of transferring money[48]. The first implementation launched in 2007 in Kenya, and there are now over 500 million mobile money accounts worldwide[48]. Mobile money can be used for savings, by keeping money in the account rather than cashing it out. But it can also be used to provide credit: simply electronically transfer the loan amount, and ask that the recipient repay later. Of course, the recipient may not repay[48].

Outreach and Efficiency of Microfinance Institutions:

Microfinance institutions (MFIs) focus on providing credit to the poor who have no access to commercial banks, in order to reduce poverty and to help the poor with setting up their own income generating businesses. Because providing credit to the poor in many cases is a very costly activity, focusing on outreach may, at least potentially, conflict with the growth of MFIs. Therefore, Western donors and NGOs have provided financial support by offering MFIs loans against below-market interest rates, helping them in lending to domestic small companies and poor agents. Recently, however, there seems to be a shift from subsidizing MFIs institutions to a focus on financial sustainability and efficiency of these institutions. This goal stresses the importance of being able to cover the cost of lending money out of the income generated from the outstanding loan portfolio and to reduce these costs as much as possible[15]. Among other things, this increased focus on financial sustainability and efficiency is due to a number of developments the microfinance business has been recently confronted with, such as the increasing competition among MFIs, the commercialization of microfinance (i.e., the interest of commercial banks and investors to finance MFIs), technological change

that also has become available for, and implemented in microfinance, and financial liberalization and regulation policies of the government[15]. These developments have induced microfinance institutions to change their behaviour, and to broaden their services and activities[15].

Innovativeness

Innovation plays an important role in influential the success of organizations. Over the years, innovativeness as an area of research has continued to be emphasized in the literature [77] Innovative products and services, including new digital financial service offerings, can help us reach more people and close the financial inclusion gap. Digital finance is already playing a major role in closing the gaps in the financial space in Nigeria[49].

Innovativeness refers to the process of translating an idea or invention into a good or service that creates value or for which customers will pay[50]. Also, it is a characteristic of individual or organization to create or adopt new ideas, processes, product or services that are intended to increase value to the customer and contribute to the performance or effectives of the organisation[50]. The emphasis on innovativeness resulted from the realization that every organization needs innovation to achieve its organizational objectives and also to deal with the changes occurring in the business environment as well as to compete successfully in the market place. Since the microfinance institutions were introduced in the 1980's, their numbers have continued to increase in developing countries across the world. These institutions have experienced remarkable growth and acceptance. More specifically, in Nigeria, MFIs are increasingly being recognized as an essential component of the financial industry in the country. Despite their important role in the financial industry in Nigeria, information concerning the nature of MFIs as well as the manner in which these institutions are managed remained limited. MFIs are created for specific objectives.[77] Although, For organizations to achieve their objectives, they must be able to perform their operations

efficiently and effectively. Organizations need to adopt effective practices to help them accomplish their objectives as well as sustain their organizational performance. The performance of organizations is measured in terms of their abilities to achieve their specific organizational objectives[50].

Theoretical Review

Theories Relating Profitability and Structure of the Microfinance Industry

The most well know theory relating to profitability is the *market power hypothesis*. The theory states that profitability is influenced by the market structure of the industry[51,52]. From this postulation, it can be said that the market power hypothesis explains the relationship between profitability and industry specific factors which is an external determinant. The market power hypothesis posits that it is market power that drives bank profitability and the assumed relationship between banking industry concentration and profitability is a positiveone. The positive association implies that increase in banking industry concentration raises bank's profitability and that the increase in industry concentration is a possible outcome of collusion by individual firms which will, at the end, create space for themselves to dominatethe industry[51]. However, collusion is far from happening considering the structure of many developing countries' microfinance industry.

There are two versions of the market power hypothesis and these are the relative *market power (RMP)* and *structure-conduct performance (SCP)* hypotheses. The structure-conduct performance approach is the notion that industry concentration improves profits through market power whilst relative market power version is of the view that bank profitability is driven by market share[51]. A study further explained that only firms with large market share and well differentiated products can have market power as well as earn non-competitive profits[52].

A study emphasized that banks in more concentrated industries can earn more profits than those in less concentrated markets, regardless of their efficiency[51,53]. The major point being put forward is that efficiency will not be of any importance if a firm is dominating the market because it will always profit due to less competition. Relating all the above postulations to Nigerian microfinance industry we can safely say that this theory explain more in terms of the industry profitability because most MFIs share small amounts of profits due to high congestion in the industry. However, some microfinance institutions operating in Nigerian are very profitable regardless the fact that the industry is less concentrated.

In contrast to the above theory, a study declared that market power exploitation and collusion possibilities are a function of the structure of the market[54]. The author went on to explain that collusion and market power exploitation may only exist if the industry is mainly characterized by imperfect competition where operating firms are price makers. On product differentiation aspect, it is complex to enhance market share and market power due to similarity and oversimplification of banking services that are offered by banks in developing countries[54].

Theories Relating Profitability and Efficiency

The most known theory that explains profitability-efficiency relationship is the *efficiency hypothesis*. The theory explains the relationship between size and profitability. Although, efficiency was an irrelevant ingredient to improving profitability under the market power hypothesis together with both its versions, it was proved a success factor under efficiency structure hypothesis (ES). Efficiency structure hypothesis is the theory that supports the view that bank performance is positively related to its efficiency[53]. The two versions to efficiency theory are the *X-efficiency* and *scale-efficiency* paradigms.

X-efficiency theory is the notion that efficient firms earn high profits due to low operating expenses[51]. This version of the theory believes that profits are a direct function of expenses levels in microfinance institutions. In this regard, for a microfinance institution to be categorized as efficient institution, it means that it is minimizing costs in order to maximize revenue.

This theory is more real in economic sense since to generate revenue, institutions always has to incur expenses but what is important is whether the firm is incurring necessary expenses and it is this ability to identify relevant expenses that leads to profit maximization as well as cost minimization. In Nigeria, microfinance institutions incur high levels of marketing cost than any other microfinance institution in the industry and this is a relevant expense that helped the organization maintain top class performance. There are also MFIs that hesitate to incur such levels of marketing expenses and these firms are said to be minimizing both profits and cost which will have a zero impact, if not a negative one on their performance.

Scale-efficiency hypothesis postulates that large institutions earn high profits due to lower unit costs and through economies of scales[51]. The underlying concept under this theory is that of the benefits of economies of scale. In one way or the other, the theory looks at all aspects of economies of scale that allows MFIs to acquire high market share which will ultimately increase industry concentration and hence profitability. According to the scale-efficiency theory, large firms are most likely to benefit from all facets of economies of scale such as managerial economies of scale. In the same vein, unit costs are spread over a wider base than if it were in the case of a small institution. However not all large banks are efficient as the theory assumes and not all bank size proxy are adequate enough to full explain the size-profitability relationship[54].

One of the important weaknesses that studies tried to highlight is that of the possibilities of diseconomies of scale coming into play. Generally growth brings prosperity but only to a

certain level and any point beyond that add more to cost that revenue[52,54]. Although lower costs tend to improve market share which implies high concentration, concentration levels do not have any influence on profitability under the efficiency theory. Closely analyzing the market power hypothesis and efficiency theory we can see that the former theory rejects efficiency as key ingredient to improving profitability while the later also invalidates concentration which is the key driver under the market power theory. However, these discussions are theoretical views but in practice both efficiency and market dominance matters for any microfinance institution to be profitable.

The Balanced Portfolio Hypothesis

The balanced portfolio theory is among less and poorly discussed theories in the banking and finance field. The theory asserts that optimum asset balance is direct outcome of rates of return and risk of individual assets making up a portfolio as well as the size of the resulting portfolio[55]. Just like what all other portfolio construction models assumes, the ideal portfolio construction process is that which takes into account risk/return characteristics of every asset making up the portfolio as well as finding the risk/return combination that minimizes risk at the same time maximizing profits.

Theories Relating Profitability and Capital

Previous studies indicated that three main theories explain the relationship between bank capital and earnings and these are the signalling, expected bankruptcy cost and risk return hypotheses[54,56]. Among these theories, some assumes positive relationship and others assume negative association.

Signalling Hypothesis

The term is self-explanatory if one bears in mind which variable is being relating to what factor. For clarity, the theory relates bank capital to earning by assuming that bank capital

signals the market value of the bank to outside stakeholders such as investors and customers. High levels of capital communicate high bank value whilst low capital signals low bankvalue. It was expressed that a higher equity value positively signals to the market value of the bank[57]. The reasoning behind this phenomenon is that high equity ratio (equity divided by debt) results in high profits[52].

A variety of justifications can explain how profits are maximised based on signalling theory. The overriding factor is that of degree of financing risk that is brought into play by introducing debt financing. When equity ratio is high, it means that the MFI has equity as main funding component in its capital structure and this reduces the likelihood of the company being liquidated to repay debt obligations thus customer and investor confidence improves as less debt is employed hence high profits. Also high equity ratio implies small or no periodic loan repayment that an MFI must honour hence more cash will be available for business which will enhance profitability.

Expected Bankruptcy Cost Hypothesis

This theory also assumes positive connection between profitability and earning. Bankruptcy cost refers to the likelihood of bank failure multiply deadweight liquidation costs which creditors must absorb in the event of failure[58]. Shareholders compensate costs borne directly by creditors through higher required rate of return on bank debts. The logic behind this hypothesis is that when expected costs increase as a result of environmental changes that increase the probability of bank failure, the optimal capital ratios increase in order to reduce the likelihood of failing and thereby lower the expected value of bankruptcy costs[58]. The theory assumes that banks avoid financial distress by accumulating higher equity when they expect bankruptcy cost to be high.

Risk-Return Hypothesis

The risk/return theory explains negative correlation between bank capital and profitability in contrast to signalling and bankruptcy cost hypotheses that assume positive relationship between the two variables. Risk/return hypothesis holds that an increase in risk yields higher returns[54]. The hypothesis opines that profits tend to increase as MFIs increases risk through increased leverage (Debt divided by equity)[52]. The author explained that there is a negative relationship between capital and profitability and that if banks expect to increase returns by taking up more risks, through increasing leverage, the equity to assets ratio will be reduced[52]. Increase in risk can be achieved by increasing leverage, that is, the equity to assets ratio.

Innovation Diffusion Theory

This theory was first proposed by Rogers in the year 1962 with the aim of explaining what subtle factors lead to spread of innovations across industries. The theory intended to explain the process involved in new technology and ideas spread among organisations. Diffusion of Innovations takes a radically different approach to most other theories of change. Instead of focusing on persuading individuals to change, it sees change as being primarily about the evolution or "reinvention" of products and behaviours so they become better fits for the needs of individuals and groups. In Diffusion of Innovations it is not people who change, but the innovations themselves. Scholars recognise five qualities that determine the success of an innovation.

a) **Relative Advantage:** This is the degree to which an innovation is perceived as better than the idea it supersedes by a particular group of users, measured in terms that matter to those users, like economic advantage, social prestige, convenience, or satisfaction. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is likely to be. There are no absolute rules for what

constitutes “relative advantage”. It depends on the particular perceptions and needs of the user group.

b) **Compatibility with Existing Values and Practices:** This is the degree to which an innovation is perceived as being consistent with the values, past experiences, and needs of potential adopters. An idea that is incompatible with their values, norms or practices will not be adopted as rapidly as an innovation that is compatible.

c) **Simplicity and Ease of Use:** This is the degree to which an innovation is perceived as difficult to understand and use. New ideas that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings.

d) **Trialability:** This is the degree to which an innovation can be experimented with on a limited basis. An innovation that is trialable represents less uncertainty to the individual who is considering it.

e) **Observable Results:** The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it. Visible results lower uncertainty and also stimulate peer discussion of a new idea, as friends and neighbours of an adopter often request information about it. According to Everett Rogers, these five qualities determine between 49 and 87 percent of the variation in the adoption of new products. These five qualities make a valuable checklist to frame focus group discussions or project evaluations. They can help identify weaknesses to be addressed when improving products or behaviours.

Empirical Review

Many empirical studies on digital finance carried. Some studies are regional, while others are limited to one country. Some of the regional studies assessed the relationship between mobile money and economic growth in some selected African nations between 1998 and 2007 and they found that mobile phones through mobile money have significantly contributed to the growth of Microfinance institution which has significant effect on economic growth in these countries, part of which emerged as a result of financial inclusion[59,60]. A study utilized novel data with the objective of exploring access to financial services to the poor by drawing on a sample across 64 countries[61]. The study discovered that the poor are not likely to formally open bank accounts or deposit their funds at conventional banks. Some authors investigated the association between financial inclusion in member countries of the Organization of Islamic Cooperation (OIC)[60]. The result revealed that access to financial services has improved physically but at a slow rate, and a tentative and an insignificant positive link to household credit and firms for financing investment is found[60].

A study reveals the role of e-banking on operational efficiency of banks in Nigeria. a study of ECOBANK, UBA ,GTB and First bank[44]. Pearson correlation was used to analyse the result obtained using the statistical package for social sciences (SPSS). Findings revealed that banks operational efficiency has improved since the adoption of electronic banking compared to the era of traditional banking, Improvement was noticed in banks revenue and capital base as well as customers loyalty. The study concluded that the more active customers are with electronic transactions the more profitable it is for the banks[44].

Some scholars studied the interaction between internet banking and bank performance is investigated by panel causality tests[62]. Banking data of 30 European countries analyzed for the period 2005-2013. ROA and ROE ratios were used as measures of bank performance. Not only whole sample consisting of Euro Area and the others but also Euro Area and the other

countries in Europe considered as samples and tested two sub-samples. Results show that a strong relationship through internet banking to the bank performance in the Euro Area countries and for the rest of the Euro Area countries are also not determined causation significantly in both directions. On the other hand, there is also a significant relationship between internet banking and performance of the bank considering the whole sample.

A study examined the significant benefits and essential elements of digital finance and to check the extent to which it can enhance the growth of financial stability in the country[63]. Two research hypotheses were the descriptive research design was adopted and the convenience sampling technique was used. The questionnaire which was structured was the main instrument used for data collection. The data collected was subjected to face validitytest, and was tested with ANOVA and chi-square technique was used to test the hypotheses. The results indicate that: a majority of Nigerians are already aware of the policy and majority agree that the policy will help fight against corruption/money laundering and reduce the risk of carrying cash. Major problems envisaged hampering the implementation of the policy are cyber fraud and illiteracy[63].

Having examined the relationship between electronic banking and bank performance in Nigeria, the study adopts data sourced from the Central Bank of Nigeria (CBN) bulletin for the period 2009 to 2017[64]. The regression analysis was used to test the strength and nature of relationship between the dependent and independent variable thereafter, the performance of the Nigerian banking sector was proxied by Total Bank Deposit while transaction values of Automated Teller Machine (ATM Debit Cards), Mobile Banking, Point of Sales (POS) and Web Pay was used as proxy for electronic banking. This study became necessary considering the increasing popularity of e-channel products in Nigerian banks and world over. The correlation results show that electronic channel products (ATM, POS, Web pay, Mobile Pay)

are positively and significantly related to bank performance. The regression results also showed that all the predictors are highly correlated to each other.

While a study is investigating the Nigeria cashless policy implementation using simple percentages and relative important index, found using a four-point Likert scale questionnaire administered to six hundred respondents[26]. The results of the study show that the twin policy objectives investigated were partially achieved. Also, the study reveals that social infrastructures in power and telecommunications need improvement and expansion and the need to create more awareness to encourage the unbanked to embrace banking culture.

A research study determines the effects of internet-banking on financial performance of financial institutions in Kenya[61]. The study adopted a descriptive survey design. The target population comprised of 31 employees of KCB, Treasury Square in Mombasa Kenya. Data collection was done through the use of questionnaires and analyzed using statistical tool. From the study, it was revealed that the effect of ICT adoption on the performance of the banking sector mainly refers to time reductions and quality improvements, rather than cost reductions.

A paper evaluates the effect of internet banking on performance (profitability ratios, noninterest operating expenses and incomes) of banks in Vietnam in the period from 2009-2014[65]. The study used random effect model (REM) and fixed effect model (FEM) to estimate the relationships between Internet indicators and bank's performance. The results from the regression model showed that internet banking had an effect on bank profitability through an increase of income from service activities.

A study reviewed the effect of Internet Banking on the financial performance of listed commercial banks in Kenya[66]. This study used descriptive survey design. The target population was all employees of listed commercial banks in Kenya. Simple random sampling

method was used to identify the study respondents. Primary sources of information were used and were gathered using questionnaires. Finally data from the questionnaires was sorted, coded and input into a software for analysis. Data was analysed using statistical package for the social sciences (SPSS) to generate diagrams, frequencies, descriptive statistics and inferential statistics. The key finding of the study revealed that digital finance has positive influence on bank incomes, operating costs, and customer deposits.

In a study, it examined the impact of four (ATM, POS, web/Internet and mobile) e-payments adoption and banks specific variables on the profitability of the Nigerian Deposits Money Banks (DMBs)[44]. Secondary data were obtained from the annual report and accounts often quoted (DMBs) between 2005 and 2012. Data were analyzed using panel logistic regression. The overall result from data analysis shows that when bank adopts e-payment systems, their performance level, such as gross margin, profits after tax, return on assets and return on equity changes. This is reflected in the positive association between adoption and gross earning of banks. Further, adoption of the four e-payment instruments like ATM, WEB, POS and Mobile banking influenced performance indices measured by return on assets (ROA), gross margin and profits after tax (PAT) of the sampled banks.

A study examined how electronic banking has impacted on the operations and performance of banks in Nigeria[47]. In pursuance of this objective, a primary data were obtained and the Pearson correlation was used to analysed the results obtained using the Statistical Package for Social Sciences (SPSS) and it was observed that the digital finance have aided banks operations and the positive performance cannot be underestimated. The viability of E-banking presents a significant prospect and opportunities to the banking operations and that the nature of E- banking is secured-enough to ensure adequate patronage by customers. It was therefore concluded that digital finance is viable and plays a significant role in the operations and performance of bank in Nigeria, coupled with the fact that Electronic banking is secured-

enough to ensure adequate patronage for good operations and performance in the financial service industry in Nigeria.

In a research study, it investigated the effect of electronic payment methods (EPM) on the profitability of commercial banks in Nigeria[67]. The study specifically investigated the effect of Automated Teller Machine (ATM), Point of Sale (POS) and Mobile Payment (MPAY) on the profitability of commercial banks in Nigeria. A total sample of five (5) banks was considered for the period 2009 to 2015 and the study adopted the Panel Least Squares (PLS) estimation technique as the analytical tool. Data were collected from the Central Bank of Nigeria (CBN) Statistical Bulletin and Annual Reports and Statements of Accounts of the five banks used in the study. Findings revealed that Automated Teller Machine (ATM) and Mobile Phone payment have a significant effect on the profitability of commercial banks in Nigeria. However, Point of Sale (POS) has an insignificant effect on commercial banks' profitability in Nigeria.

A study assessed e-commerce and e-banking channels and their contributions to the Nigerian economy, sampling 100 respondents selected from banks and the general public[68]. The study employed non- parametric statistics measure such as chi-square in testing the formulated hypothesis. The results of the test established that e-commerce and e-banking have significant positive impact on the Nigerian economy. In a study, it examined electronic banking products and performance of Nigerian banks using systematic sampling technique[69]. The study revealed that electronic banking products (e-mobile and ATM transactions) strongly and significantly impact on the performance of Nigerian banks.

In 2013, some authors investigated the influence of digital tools on the performance of Nigerian financial sector[70]. The study became necessary as a result of increased penetration of electronic banking which has redefined the financial operations in Nigeria and the world. The study used systematic sampling technique and six (6) banks were selected as the sample

of the study. Data were collected from the secondary source through the annual report and accounts of the sampled Banks and insider information from the employees working in the selected banks, respectively. The performance of these banks was measured in terms of returns on equity (ROE). The study revealed that the adoption of electronic banking products (Mobile money, POS and ATM transaction, Internet Banking) has strongly and significantly impacted on the performance of Nigerian banks.

A study investigated the impact of digital tools in Nigeria. Survey research was adopted with the questionnaire as data collection instrument[71]. Responses from the respondents show that digital tools will increase employment; reduce cash related robbery thereby reducing the risk of carrying cash; digital tools will also reduce cash related corruption and attract more foreign investors to the country.88 The study, therefore, shows that the introduction of the cashless economy in Nigeria can be seen as a step in the right direction. It is expected that its impact will be felt in the modernization of Nigeria payment system, reduction in the cost of banking services, reduction in high security and safety risks and also curb banking related corruptions.

A study examined the effects of digital tools on the profitability of commercial banks in Kenya[72]. These data were collected from the Central Bank of Kenya and Commercial banks. Regression analysis was done for the period to determine the effects of electronic banking using digital tools on the profitability of commercial banks in Kenya. The study covered a period of 5 years from the year 2009 to 2013. The findings on the coefficient of determination, the study found that major changes in the financial performance of commercial banks in Kenya could be accounted to changes in internet banking, the point of sales, automatic teller machine, mobile banking and size of the bank at 95% confidence interval. The study found that there was a strong positive relationship between the financial performance of commercial banks and electronic banking, as it was found that there was a strong relationship between the financial performance of commercial banks and electronic

banking. Size of the bank was also found to positively influence the financial performance of commercial banks in Kenya.

A study examined the effects of digital tools on financial performance of deposit money bank in Nigeria[66]. Data for the study were collected from statistical bulletin of Central Bank and annual reports and accounts of Nigerian banks. Electronic banking measured with the Automatic teller machine, internet banking and POS and financial performance was measured with profitability of deposit money banks in Nigeria. Multiple regression technique was used. The study revealed that ATM does not contribute to profitability of the sampled banks and also is not significant to banks profitability, POS has a positive contribution to bank profitability, and is also statistically significant to bank profitability, likewise, internet banking also has a positive contribution and statistically significant to profitability of the banks.

A study investigated the effect of digital finance on the performance of commercial banks in Nigeria[73]. Data was analyzed with regression analysis technique. Findings of the research showed that there is a statistically significant positive relationship between ATM transactions and the assets base of commercial banks in Nigeria. Internet (online) banking transactions had a positive relationship with the asset base of commercial banks. There is a positive and statistically significant relationship between mobile banking transactions and the assets base of commercial banks.

A study estimated the impact of mobile banking transactions on bank profitability in Nigeria using selected banks data from Electronic payment system office, Central Bank of Nigeria statistical bulletin from 2007-2016[74]. The study adopts Panel unit root and SURE model estimation technique to conduct quantitative analysis for four selected old and new generation banks. The results of this study were analyzed using economic a priori criteria, statistical criteria and econometric criteria. The positive and statistically significant relationship

between automated teller machine of old and new generation banks in Nigeria indicates that automated teller machine is a major factor that contributes to old and new banks performance in Nigeria. The positive and statistically significant relationship between point of sale of old and new generation bank in Nigeria indicates that point of sale is a major factor that contributes to old and new banks performance in Nigeria.

A study investigated the effect of Electronic payment Methods (EPM) on the profitability of commercial banks in Nigeria[67]. The study specifically investigated the effect of Automated Teller Machine (ATM), Point of Sale (POS) and Mobile Payment (MPAY) on the profitability of commercial banks in Nigeria. A total sample of five (5) banks was considered for the period 2009 to 2015 and the study adopted the Panel Least Squares (PLS) estimation technique as the analytical tool. Findings revealed that Automated Teller Machine (ATM) and Mobile Phone payment have significant effect on the profitability of commercial banks in Nigeria. However, Point of Sale (POS) has an insignificant effect on commercial banks' profitability in Nigeria.

A study examines the impact of electronic banking on the profitability of commercial banks in Nigeria[75]. The study sought to examine the relationship between different e-banking channels and the profitability of commercial banks in Nigeria. Four e-banking channels (automatic teller machines, electronic mobile banking, internet banking transactions, and point of sales services) were identified and regress against the profit before tax of commercial banks operating in Nigeria between 2006 and 2014. The study used the confirmed ECM model (via residual diagnosis) to test the formulated hypotheses. The results revealed that the over impact of electronic banking on the profitability of commercial banks was significant; whereas, the impact of the individual channels was varied.

A research study studied the relationship between electronic banking and the performance of Nigerian commercial banks[76]. Electronic banking was proxied by value of Point-of-Sale

transactions while commercial banking performance was proxied by customers' deposits. The results show that POS is not significant with both the savings and time deposits but significant with demand deposits.

Some scholars investigated the effects of electronic-based banking services on the profitability of 23 commercial banks in both developed and developing countries from 2005 to 2013[62]. The study adopted the panel data analytical methodology. Number of branches to number of ATM ratio, point of sale (POS) and web (internet) banking served as the explanatory variable while return on equity (ROE) and return on assets (ROA) were the dependent variables. Findings revealed that ratio of number of branches to number of ATM have positive and significant effect on banks' profitability in both developed and developing countries. Some authors studied the effect of cashless policy, saving and bank credit on Nigerian deregulated economy[77]. Data were collected from annual accounts. Ordinary least square econometric technique was used to analyze the data. Findings from this study revealed that the marginal productivity coefficient of bank credit to the domestic economy is positive but insignificant. The implication is that banks credit did not affect the productive sectors sufficiently for the latter to impact significantly on the Nigerian economy.

A study empirically investigated the impact of electronic banking on the satisfaction of customers using GTB bank, Lagos as a case study[78]. A sampled of 100 respondents were administered structured questionnaire. Data obtained were analyzed with descriptive measures such as simple tables and percentages. The formulated hypotheses were validated using the chi-square statistical measure. The empirical result from the chi-square analysis revealed that electronic banking has significant relationship with customer satisfaction in GTB bank and general banking customers. The result also revealed that the introduction of electronic banking has enhanced bank profitability level. Finally, the results showed the application of electronic banking has increased the market share of banks in Nigeria.

While examining the correlation that exist between bank profitability and ATM, POS electronic funds transfer, and internet banking 100, it was discovered that all electronic channels adopted as independent variables exhibited negative correlations with bank profitability except debit and credit cards[79]. Also, a study found a negative relationship between mobile banking and bank performance[81]. The result is as a result of the increasing number of unsuccessful transactions, which discourage individuals from using the medium. One can infer that such failures are associated with poor technological infrastructures, power failure and knowledge gap in the operations of mobile banking. Two researchers stated that digital financial services is growing, work on digital finance is still limited because of the lack of representative data[82]. Recent experimental studies in the area of digital finance (mainly mobile banking) in Nigeria find that access to digital banking helps female entrepreneurs to save more in the digital platforms compared to other forms of savings, improves control over finances, significantly improves migrant's ability to transfer remittances and helps consumption smoothing in the face of negative shocks.

A study investigated the impact of the various methods of electronic payments on the growth of the Nigerian economy between 2005 and 2012[83]. The study established that automated teller machines (ATMs) have positively contributed to the economic growth of Nigeria, whereas online payment, POS terminals, mobile payments and checks have negative relationships with the growth. Another study undertaken by 3 established that awareness, consumer/user value proposition and infrastructure have significant relationships with financial inclusion, whereas the business model of financial services providers has an insignificant relationship with financial inclusion in Nigeria.

A study explored whether religion in Nigeria hinders the achievement of Nigeria's financial inclusion target rate of 80% by the year 2020[13]. The data for the study were generated through semi-structured interviews and documentary evidence. It established that almost all

the programs of the Central Bank of Nigerian that enhance financial inclusion are not religion based. Therefore, interest is not a factor hindering Nigeria's financial inclusion target set to be achieved by the year 2020.

A study investigated the profitability performance of Nigerian financial Institutions following the full adoption of digital banking system[84]. The study result showed an increased penetration of digital finance which has redefined the banking operations in Nigeria and around the world. Judgmental sampling method was adopted by utilizing data collected from four Nigerian banks. The profitability performance of these banks was measured in terms of returns on equity (ROE) and returns on assets (ROA). With the data collected, we tested the pre- and post-adoption of e-banking performance difference between means using a standard statistical technique for independent sample at 5 percent level of significance for performance factors such as ROE and ROA. The study revealed that the adoption of electronic banking has positively and significantly improved the returns on equity (ROE) of Nigerian banks. On the other hand and on the contrary, it also revealed that e-banking has not significantly improved the returns on assets (ROA) of Nigerian banks. The findings of this study have motivated new recommendations for bank customers, bank management and shareholders with regard to electronic banking adoption for banking operations.

Two researchers examined the effect of digital finance on the performance of banks in Nigeria[85]. The study used survey research design and employed structured questionnaire using Taro Yamane formula. Point in time data was collected from primary source and Ordinary Least Square was adopted in analyzing the data. Findings reveal that digital finance, cheap internet costs, 24hours internet services and ICT competence of customers contributed significantly to the performance of banks in Nigeria. Therefore, the study concludes that the effect of digital finance on the bank performance is significant.

The impact of digital finance on the operational efficiency of Banks in Nigeria was examined by a study[86]. It uses a primary source of data collection using regression analysis. Findings reveal that the use of digital finance (Internet and Mobile banking) by the banks has improved the efficiency of these Banks thereby leading to more profitability. Also in terms of providing efficient services to customers electronically, reduces time taken to servecustomers, allows new customers to open an account online, customers have easy access to their account all the time at their convenience. A study examined the effect of internet banking on operational performance of commercial Banks in Nakuru County, Kenya[87]. Primary data was analyzed using correlation and regression analysis. The study established that internet banking has a positive and significant effect on the operational performance of the commercial banks.

A study observes 424 community banks among the first wave of banks to adopt digital finance[88]. It compared their financial performance to that of 5175 branching-only community banks. They noted that viable community banking franchises offer the digital finance which has improved community bank profitability, chiefly through increased revenues from deposit service charges. Internet adoption was also associated with movements of deposits from checking accounts to money market deposit accounts, increased use of brokered deposits, and higher average wage rates for bank employees. They find little evidence of changes in loan portfolio mix which suggest that these initial click-and-mortar banks (and their customers) used the digital channel as a complement to, rather than a substitute for, physical branches.

Theoretical Framework

The theoretical framework of this research study hinges on the innovation diffusion theory by a renowned scholar[89]. The theory viewed that new technological adoption was a time based process which involves decision making situations among members of a social setup. He characterized that diffusion of innovation followed five factors which were awareness, interest, evaluation, trial and lastly adoption. According to a scholar, an innovation is an item or process that a given social system views as new relative to existing ones[90]. It is for this reason that two researchers idealise that before innovations can fully take shape in a market, their inputs and outputs should be seen to be measurable and satisfactory to the users[91]. The technology should be relatively easy to use and thus be able to attract the users.

Innovation diffusion theory focuses on the new item characteristics. In this regard, the theory views that acceptability of new technologies are triability, complexity compatibility, observability and relative advantage are perquisite features that determines successful spread of innovations[92]. This means that technological tools should fulfil those features before they are adopted. Innovations must have benefits for them to be successfully adopted by the intended users. In connection to this study, technological innovations should be characterised with ease of use in order to be adopted in the market. Some scholars cite that IDT is a good hypothesis that provides valuable information on the how innovations spread and adopted by consumers in an economy[93].

Innovation diffusion theory is pertinent to this study because it shows the process of new technological innovations adoptions in a social set up. The adoption of technological innovations is meant to widen the market base of financial institutions. Having noted this, it is therefore true to suffice that adoption of innovations has a potential of enhancing financial performance due to increased markets. Such tools such as use of point of sales, internetbanking, agent banking, and mobile money make carrying out microfinance institution

transactions convenient and cheaper as opposed to visiting the traditional microfinance institution halls. In a functional form, the relationship between digital economy tools and microfinance performance is expressed as:

$$mfp = f(dlet) \quad (2.1)$$

Mathematically, it is stated as:

$$mfp = {}_0 + {}_1 dlet \quad (2.2)$$

Where: *mfp* represents microfinance performance measuring deposit, branches, borrower per staff, depositor per staff and profitability; *dlet* denotes the digital economy tools; and $_0$, $_1$ are parameters.

Summary of Gaps in the Literature

Despite the high numbers of studies conducted to show the factors determining the performance of microfinance banks, it can be seen that there are a limited number of studies paying attention to comparing and contrasting the impact of digital economy tools compositions such as point of sales, internet banking, agent banking, and mobile money on the microfinance bank performance indices like deposit, branches, borrower per staff, depositor per staff and profitability in developing countries like Nigeria. The findings of the existing studies of both developed and developing economies can best be described as inconclusive. This provides some gaps in existing empirical research to examine the link between compositions of digital economy tools and microfinance bank performance, especially when distinguishing between the effects of changes in the compositions of digital economy tools on various levels of microfinance performance indices like deposit, branches, borrower per staff, depositor per staff and probability. Therefore, this study is to bridge these gaps in existing empirical research by investigating the effects of digital economy tools

compositions on the microfinance banks' performance regarding their deposit, branches, borrower per staff, depositor per staff and probability.

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Chapter Three

Methodology

The methodology of this study is presented in a way to explain the empirical modeling and estimation approaches used to estimate the parameters. The discussion under this chapter is divided into five different sections. Thus, the empirical modeling is specified in line with the specific objectives of the study. For the second section, the theoretical expectation is presented to explain the a'priori presumptions between the variables in the model specifications. The third part provides the estimation techniques used to estimate the coefficients while the last part of the study provides data sources and measurements.

Model Specification

Empirical Model of Digital Economy Tools on Business Profitability of Micro-Finance Banks

Following the theoretical framework of the innovation diffusion theory developed in the last section of the previous chapter and the models of previous studies[1,2,3,4], the adapted model relating to the links between digital economy tools (such as point of sales, internet banking, agent banking, automated teller machine, and online banking) on business profitability of micro-finance banks including other relevant control variables (i.e. firm size, macroeconomic performance variables - interest rate, inflation rate) is stated in a functional form as:

$$bp_{it} = f(pos_{it}, ibk_{it}, abk_{it}, atm_{it}, onbk_{it}, fs_{it}, \text{int}_{it}, \text{inf}_{it}) \quad (3.1)$$

In mathematical form, it becomes:

$$bp_{it} = {}_0 + {}_1 pos_{it} + {}_2 ibk_{it} + {}_3 abk_{it} + {}_4 atm_{it} + {}_5 onbk_{it} + {}_6 fs_{it} + {}_7 \text{int}_{it} + {}_8 \text{inf}_{it} + e_{it} \quad (3.2)$$

Where: *bp* denotes a vector of business profitability measures i.e. return on assets (*roa*) and return on equity (*roe*); *pos* represents point of sales; *ibk* is internal baking; *abk* denotes agent banking; *atm* is automated teller machine; *onbk* is online banking; *fs* is firms size measured by natural logarithm of total assets; *int* is interest rate; *inf* is inflation; $_0$, $_{1\ 8}$ are parameters; *i* represents firms; *t* denotes time; and *e* is error term.

Empirical Model of Digital Economy Tools and Deposit Mobilization of Micro-Finance Banks

To investigate the impact of digital economy tools on deposit mobilization of micro-finance banks, the study modelled micro-finance deposit mobilization as a function of digital economy tools (such as point of sales, internet banking, agent banking, automated teller machine, and online banking) including the relevant control variables i.e. firm size, interest rate, inflation rate[1,2,3,4]. The baseline model for the time series analysis is specified below as:

$$dm_{it} = f(pos_{it}, ibk_{it}, abk_{it}, atm_{it}, onbk_{it}, fs_{it}, \text{int}_{it}, \text{inf}_{it}) \quad (3.3)$$

To estimate the parameters, the function is transformed into the generalized equation below as:

$$dm_{it} = \gamma_0 + \gamma_1 pos_{it} + \gamma_2 ibk_{it} + \gamma_3 abk_{it} + \gamma_4 atm_{it} + \gamma_5 onbk_{it} + \gamma_6 fs_{it} + \gamma_7 \text{int}_{it} + \gamma_8 \text{inf}_{it} + \quad _{it} \quad (3.4)$$

Where: *dm* denotes a vector of deposit mobilization indicators i.e. total deposit (*td*) and depositor per staff (*dps*); *pos* represents point of sales; *ibk* is internal baking; *abk* denotes agent banking; *atm* is automated teller machine; *onbk* is online banking; *fs* is firms size measured by natural logarithm of total assets; *int* is interest rate; *inf* is inflation; $\gamma_0, \gamma_{1\ 8}$ are parameters; *i* denotes firms; *t* denotes time; and is disturbance term.

Empirical Model of Digital Economy Tools and Micro-Finance Bank Branches

To examine the role of digital economy tools (such as point of sales, internet banking, agent banking, automated teller machine, and online banking) in micro-finance banks branches, the study modelled micro-finance bank branches as a function of digital economy tools, including the relevant control variables i.e. firm size, interest rate, inflation rate[1,3,4,5,6,7]. The baseline model for the time series analysis is specified below as:

$$mbb_{it} = f(pos_{it}, ibk_{it}, abk_{it}, atm_{it}, onbk_{it}, fs_{it}, \text{int}_{it}, \text{inf}_{it}) \quad (3.5)$$

To estimate the parameters, the function is transformed into the generalized equation below as:

$$mbb_{it} = \quad _0 + \quad _1 pos_{it} + \quad _2 ibk_{it} + \quad _3 abk_{it} + \quad _4 atm_{it} + \quad _5 onbk_{it} + \quad _6 fs_{it} + \quad _7 \text{int}_{it} + \quad _8 \text{inf}_{it} + \quad _{it} \quad (3.6)$$

Where: *mbb* denotes a vector of micro-finance bank branches measured by numbers of micro-finance bank branches; *pos* represents point of sales; *ibk* is internal baking; *abk* denotes agent banking; *atm* is automated teller machine; *onbk* is online banking; *fs* is firms size measured by natural logarithm of total assets; *int* is interest rate; *inf* is inflation; $_0$, $_1$ $_8$ are parameters; *i* is firms; *t* denotes time; and is disturbance term.

Empirical Model of Digital Economy Tools and Loan Disbursement of Micro-Finance Bank

To estimate the impact of digital economy tools on loan disbursement of micro-finance bank, the study modelled loan disbursement measured by borrowers per staff as a function of digital economy tools (like point of sales, internet banking, agent banking, automated teller machine, and online banking), including the relevant control variables i.e. firm size, interest rate, and inflation rate[1,3,4,5,7]. The baseline model for the time series analysis is specified below as:

$$ldt_{it} = f(pos_{it}, ibk_{it}, abk_{it}, atm_{it}, onbk_{it}, fs_{it}, \text{int}_{it}, \text{inf}_{it}) \quad (3.7)$$

To estimate the parameters, the function is transformed into the generalized equation below as:

$$ldt_t = {}_0 + {}_1 pos_{it} + {}_2 ibk_{it} + {}_3 abk_{it} + {}_4 atm_{it} + {}_5, onbk_{it} + {}_6 fs_{it} + {}_7 \text{int}_{it} + {}_8 \text{inf}_{it} + {}_{it} \quad (3.8)$$

Where: *ldt* denotes a vector of loan disbursement measured by borrowers per staff; *pos* represents point of sales; *ibk* is internal baking; *abk* denotes agent banking; *atm* is automated teller machine; *onbk* is online banking; *fs* is firms size measured by natural logarithm of total assets; *int* is interest rate; *inf* is inflation; $_0$, $_1$ $_8$ are parameters; *t* denotes time; and is disturbance term.

Theoretical Expectation

In regards to the theoretical expectation of microfinance bank growth models, the study expects a direct relationship between the indices of digital economy tools (point of sales, internal baking, agent banking, automated teller machine, and online banking) and micro-finance growth indicators (profitability, deposit mobilization, bank branches and loan disbursement). It is expected that an improvement in the area of digital finance tools will enhance a great number of areas of the microfinance banks relating to customer deposit, bank branches, borrower per staff, depositor per staff and profitability. Similarly, firm size is presumed to have a positive relationship with the growth indices of micro-finance banks. In contrary, interest rate and inflation rate have an indirect impact on the performance indices of micro-finance banks measured by the industry's profitability, deposit mobilization, bank branches and loan disbursement. This means that low lending rate and declining cost of business have the chances of improving the industry's customer deposit, bank branches, borrower per staff, depositor per staff and profitability.

Estimation Techniques

Following the empirical models stated above, the study the pooled Ordinary Least Square (OLS) regression as a baseline model as:

$$y_{i.t} = \quad_0 + \quad x_{i.t} + \mathrm{B}Z_{i.t} + \quad_{i.t} \qquad (3.9)$$

Where: y is outcome variable; x represents the main explanatory variable; Z is other control variables; $_0$, , B are parameters; i indicates country; t is time; and is error term. It is worthy to note that the pooled OLS do not control for countries' unobserved individual effects. Meanwhile, studies have noted that the measurements of the estimated parameters can sometimes be influenced by difference in firms under study[8].

Moreover, some of the benefits that can be derived from a panel model that include firms' individual differences are: (a) it enables the study to account for firm heterogeneity[9]. For instance, many firms have differences in their policies, strategies, goals, vision etc.[10]. (b) the result may likely be biased if individual heterogeneity is not taken into account even with a large sample size. Therefore, taking the heterogeneity factor into consideration will give a robust and unbiased result. Incorporating unobserved firms' individual effects, equation (3.9) is rewritten as:

$$y_{i.t} = \quad_0 + \quad x_{i.t} + \mathrm{B}Z_{i.t} + v_i + \quad_{i.t} \qquad (3.10)$$

The variables are as previously defined. represents the unobserved firms' individual effect which indicates the differences between pooled OLS regression model and a panel model with firm heterogeneity. If is independent of the determinants of digital economy tools (independent variables), it implies that has zero mean, constant variances (^{2}), independent of the observed individual stochastic term. In this case, the random effects model is appropriate indicating no correlation between firm heterogeneity and the variable

determinants of digital economy tools. In contrast, if relationship exists between unobserved firms' individual effects and independent variables, the most appropriate estimation techniques to use is fixed effects model.

The Hausman statistic's value is used to test for the possible existence of level of association between country heterogeneity and financial development determinants at the conventional levels. The null hypothesis of no correlation is specified against the alternative hypothesis indicating the existence of correlation. If the study fails to reject the null hypothesis implying no correlation, the random effect model is appropriate for estimating the parameters. However, if the alternative hypothesis was not rejected indicating the relevance ofcorrelation, it implies that the fixed effects model is appropriate for estimating the relationship between digital economy tools and microfinance bank growth indices.

The study further analyze the model using two-way error components by expanding equation (3.10) to incorporate the unobserved firms' individual effects and time effects components. The model is stated as:

$$y_{i.t} = \quad_0 + \quad x_{i.t} + \mathrm{B}Z_{i.t} + v_i + \quad_t + \quad_{i.t} \qquad (3.11)$$

Where: $\quad_i$ represents unobserved firms' individual effects; $\quad_t$ is unobserved time effects which account for periods that are not included varying across time but constant cross-sectionally; $\quad_{i,t}$ denotes the residual stochastic term. Equation (3.11) represents a two-way component fixed effect model as we assumed both $\quad_i$ and $\quad_t$ to be fixed parameters and the residuals to be stochastic $IID\left(0, \quad^2\right)$.

Sources of Data

This study examines the effect of digital economy tools on selected microfinance bank performance in Nigeria for the period 2010 to 2020. The study uses secondary type of time series data for the variables, microfinance performance indicators i.e. deposit, branches, borrower per staff, depositor per staff and profitability; digital economy tools measured by point of sales, internet banking, agent banking, and mobile money; firms size measured by total assets; liquidity measured by current ratio; interest rate; and inflation that were obtained from the Annual reports of ten microfinance banks considered to be the most market capitalized microfinance banks in Nigeria. The lists of the microfinance banks are Lift Above Poverty Organisation (LAPO), Grooming Centre, Self reliance Economic Advancement programme (SEAP), Accion, AB Microfinance, Advance Lafayette, ASHA Microfinance, BAOBAB Microfinance, LA Fayette Microfinance, LETSHEGO Microfinance, NIRSAL Microfinance, and NPF Microfinance.

Endnotes

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Chapter Four

Result and Discussion of Findings

This phase of the research study covers the detailed empirical analyses of the effect of economic digital tools on the growth of micro-finance institutions in Nigeria. The study presents the details of data presentation, descriptive statistics, pre-estimation tests and estimation results of the investigation of the links between economic digital tools and microfinance institutions in Nigeria. This chapter is divided into descriptive analysis which shows the measure of central tendency that includes the mean, median and measures of variation. It also takes into consideration the trend analysis which shows the trend of the time series data used from 2010-2020 and econometric analysis which focuses on test for cross-section dependence and panel fixed effect based on the Hausman test results.

Descriptive Analysis

This section presents descriptive analysis of the variables used in analyzing the effect of digital economy tools on the growth of micro-finance banks in Nigeria. The summary statistics of the series regarding the sampled microfinance banks are presented in Table 4.1. Likewise, Table 4.2 presents the mean and standard deviation values of individual firms considered for the research study. The total number of sampled firms understudy is eight with a sample period of 11 years, 2010-2020. The data used for analyzing the relationship between digital economy tools and microfinance banks growth is presented in the Appendix. More so, the detailed estimated results for the entire test carried out in this study are presented in the appendix under different sections accordingly.

The descriptive statistics report that the average of return on assets and return on equity are 0.073 and 0.127 respectively. This implies that the financial institutions have a higher profitable equity when compared to the percentage of proceeds from assets generating

revenue. It shows that the microfinance banks take on some financial leverage to increase their assets. With a 7.3% ROA, the financial performance of the selected firms is considered weak. Comparing the performance among the microfinance companies, LAPO microfinance performed better with ROE (0.186) while ACCION Microfinance has the highest ROE standing at 0.155 (see Table 4.2). The difference between the two indicators of the firms is not much as it indicates a low or manageable usage of debt to generate profits over the periods understudy. Thus, shareholders' funds are adequately used to generate profit for the firm. The next firms with high return on assets are LAPO Microfinance (0.149), and Advance Microfinance (0.120). Comparing the ROA with their respective firms' ROE values indicate a high financial leverage. The remaining firms' average return on assets is 0.049, 0.033,0.029, 0.029, and 0.016 for NPF Microfinance, BAOBAB Microfinance, AB Microfinance, Hasal Microfinance and Grooming Microfinance respectively.

Table 4.1: Summary Statistics

Signs	Variable Measurements	Mean	Std. Dev.	Maximum	Minimum	Kurtosis	Skewness	Obs.
roa	Return on assets	0.073	0.082	0.324	0.001	2.585	1.788	81
roe	Return on equity	0.127	0.094	0.422	0.001	0.784	0.879	81
td	Total deposit(₦'Billion)	4837263.89	14970845	79922615.9	1316507	12.461	3.542	81
dps	Depositors per staff	209.36	122.622	578	40	0.712	0.980	81
mbb	No. of microfinance bank branches	121.31	179.963	605	5	0.847	1.524	81
bps	Borrowers per staff	169.21	98.099	373	37	-1.010	0.653	81
pos	Point of sales	32.210	93.042	432	0	12.409	3.609	81
ibk	Internet Banking	0.543	0.501	1	0	-2.019	-0.177	81
abk	Agent Banking	25.235	95.968	486	0	18.824	4.427	81
atm	Automated teller machine	1.494	2.689	11	0	3.312	2.067	81
onbk	Online banking	0.469	0.502	1	0	-2.035	0.126	81
fs	Total assets (₦'Billion)	17966291.02	31296577.5	177590655.2	47427024	11.864	3.319	81
inf	Inflation Rate (annual rate of consumer price index)	11.933	2.662	16.524	8.062	-0.958	0.157	88
int	Interest Rate (%)	16.442	1.071	17.585	13.642	1.851	-1.537	88

Note: Std Dev. - standard deviation; Max. - maximum; Min. - minimum; Obs. - observation.
Source: Author's computation (2022).

Furthermore, Table 4.1 shows the average total deposit and depositors per staff of firms standing at ₦4,837,263.89 and 209.36 with maximum values of ₦79,922,615.9 and 578 and minimum values at ₦1,316,507 and 40 respectively. The average value of total deposit with 20.9.36 depositors per staff indicates that the microfinance firms' has a sizeable volume of depositors' funds. High differences (range) between the maximum and minimum values indicate some outliers in the depositors' indicators. As presented in Table 4.2, it is noted in the firms' respective numbers of microfinance bank branches as it recorded an average of 121.31. The mean of microfinance bank branches are: Grooming Centre (388.82), and LAPO Microfinance (385.18) respectively. Afterwards, others recorded double digits and they are: ACCION Microfinance (39.18), NPF Microfinance (30.73), Hasal MFB (18.1), AB Microfinance (15.18), BAOBAB Microfinance (13.75), and Advance Lafayette (10.63) correspondingly. With the firms' borrowers per staff, it shows a higher numbers of borrowers in relations to staffs working in the microfinance banks. Concerning the indicators of digital economy tools, the average of point of sales, internet banking, agent banking, automated teller machine, and online banking stand at 32.21, 0.543, 25.24, 1.49 and 0.57 respectively. In that order, their maximum values are 432, 1, 486, 11 and 1, while the minimum values are 37 and 0 for the four variables.

Table 4.2: Average of Digital Economy Tools and Microfinance Banks Growth

	roa	roe	td	dps	mbb	bps	pos	ibk	abk	atm	onbk
Accion	0.155	0.178	5674.509	193.55	39.18	111.818	72.273	0.545	165.36	4.636	0.545
	(0.104)	(0.106)	(2618.36)	(67.52)	(25.98)	(21.12)	(113.6)	(0.522)	(220.1)	(4.523)	(0.522)
AB Microfinance	0.029	0.102	6186.38	125.82	15.182	80.636	151.273	0.727	8.727	0.727	0.727
	(0.011)	(0.029)	(2988.08)	(52.85)	(5.474)	(15.83)	(183.3)	(0.467)	(5.605)	(0.467)	(0.467)
BAOBAB Microfinance	0.033	0.163	4654.77	160.13	13.750	79.875	10.500	1.000	10.000	1.500	1.000
	(0.010)	(0.051)	(4246.62)	(19.11)	(8.565)	(9.891)	(9.957)	0.000	(9.258)	(0.535)	0.000
LAPO MFB	0.149	0.186	92285.27	381.73	385.18	275.9	0.000	0.364	4.000	0.000	0.364
	(0.116)	(0.147)	(38200.86)	(141.7)	(96.40)	(67.00)	0.000	(0.505)	(6.943)	0.000	(0.505)
Grooming Centre	0.016	0.036	28800.45	330.9	388.82	304.55	0.364	0.182	0.455	0.909	0.182
	(0.000)	(0.000)	(14225.37)	(56.65)	(187.5)	(48.82)	(0.809)	(0.405)	(1.036)	(2.023)	(0.405)
Hasal MFB	0.029	0.094	2222814.0	93.300	18.100	143.60	5.400	0.400	0.000	1.300	0.400
	(0.032)	(0.106)	(427616.6)	(30.23)	(5.744)	(35.82)	(8.262)	(0.516)	0.000	(1.767)	(0.516)
Advance Lafayette	0.120	0.126	46001377.4	106.9	10.625	74.00	1.000	0.875	0.000	3.375	0.750
	(0.066)	(0.069)	(20160904.2)	(64.03)	(3.503)	(21.53)	0.000	(0.354)	0.000	(3.852)	(0.463)
NPF Microfinance	0.049	0.137	7233.229	230.6	30.727	230.6	0.000	0.455	0.000	0.000	0.000
	(0.020)	(0.051)	(3773.40)	(67.11)	(3.797)	(67.11)	0.000	(0.522)	0.000	0.000	0.000

Note: roa - return on assets; roe - return on equity; td - total deposit (₦'Billion); dps - depositors per staff; mbb - no. of microfinance bank branches; bps - borrowers per staff; pos - point of sale; ibk - internet banking; abk - agent banking; atm - automated teller machine; onbk - online banking; fs - firm size measured by natural log of total assets; inf- inflation rate; int - interest rate.
Standard deviations are in parenthesis "()".
Source: Author's computation (2022).

Concerning the variability, total deposit is largely dispersed across firms in the industry over the periods which indicate high level of difference in client base among the member states. Other indicators of growth of the microfinance banks are dispersed across the firms but not as much as the variability in digital economy tools. From Table 4.1, the summary statistics showed that all the microfinance bank growth indicators are rightward skewed. As well, total deposit, point of sales, agent banking, and automated teller machine are highly peaked (implying leptokurtic) and the remaining indices of digital economy tools and banking growth are platykurtic.

Equally, the summary statistics of the controlling variables are reported in Table 4.1. The average total assets of the selected firms is ₦17,966,291.02 million. As to macroeconomic factors measured by inflation rate and interest rate, their average rates are 11.93% and 16.44% respectively. The maximum numbers of inflation rate and interest rate of these selected firms are 16.53% and 17.59% while their minimums are 8.06% and 13.64% correspondingly. Concerning the skewness results, it indicates that interest rate is negatively skewed while total assets and inflation rate skewed rightward. Likewise, the Kurtosis confirmed that the series are not normally distributed as inflation rate and interest rate have flat surface (platykurtic) while total assets is highly peaked (leptokurtic).

Test of Hypotheses

In this section, the research study presents the empirical results in regards to the set objectives in the following four sub-sections. Prior to the findings of the stated objectives, pre-estimation test such as correlation analysis for the detection of multicollinearity problem,cross-section dependency test and Hausman tests to decide the appropriate estimation test results between panel fixed effects and panel random effects. The outcomes are presented in the following sub-sections.

Analysis of the First Hypothesis

This sub-section reports the empirical results relating to the relationship among digital economy tools and microfinance banks profitability in Nigeria.

Correlation Analysis

Table 4.3 presents the partial correlation coefficients of the variables relating to the relationship among digital economy tools and microfinance banks profitability in Nigeria. The coefficient of correlation result shows that point of sales, internet banking, agent banking, and online banking have a positive level of association with the selected microfinance banks' return on assets except automated teller machine which has a negative correlation coefficient. As for return on equality, it positively correlated with all the indictors of digital economy tools i.e. point of sales, internet banking, automated teller machine, agent banking, and online banking.

Table 4.3: Correlation Matrix

	roe	pos	ibk	abk	atm	onbk	fs	inf	int
roa	0.647	-0.087	0.019	0.063	-0.008	0.026	0.053	0.077	0.054
roe	1	0.090	0.402	0.249	0.176	0.349	-0.082	0.007	-0.043
pos		1	0.319	0.093	0.270	0.370	-0.073	0.070	-0.145
ibk			1	0.243	0.503	0.812	0.277	0.233	-0.267
abk				1	0.585	0.281	-0.059	0.105	-0.183
atm					1	0.595	0.432	0.186	-0.260
onbk						1	0.247	0.177	-0.227
fs							1	0.128	-0.265
inf								1	0.119

Note: roa - return on assets; roe - return on equity; pos - point of sale; ibk - internet banking; abk - agent banking; atm - automated teller machine; onbk - online banking; fs - firm size measured by natural log of total assets; inf- inflation rate; int - interest rate.
Source: Author's computation (2022).

The correlation coefficients of microfinance banks profitability and other controlling variables are presented in Table 4.3. Concerning the other explanatory variables, return on assets has a direct relationship with firms size, inflation and interest rate. With reference to the return on equality, it has a positive correlation with inflation and negative correlation with firms size and interest rate. The correlation matrix table also shows the correlation coefficients among the digital economy tools and other controlling factors of microfinance banks profitability variables at different magnitudes and degrees. The values of the correlation coefficients revealed the absence of multicollinearity problem. Thus, the problem of multicollinearity is avoided in the empirical analysis. Nonetheless, the results of the correlation coefficients are just preliminary analyses that are being put through confirmation in the next sub-section after considering other determinants of microfinance banks profitability.

Regression Analysis for the First Hypothesis

The panel fixed and random effects' methods were employed in estimating the panel regression models that examined the effects of point of sale; internet banking; agent banking; automated teller machine; online banking, other factors such as firm size, inflation and interest rates. Also, five forms of estimated panel regression models were reported following the indicators of microfinance banks performance. The first and second augmented model regresses return on assets and return on equity on digital economy tools (measured by point of sale; internetbanking; agent banking; automated teller machine; online banking), and other control variables (firm size, inflation and interest rates) correspondingly. More so, the estimated coefficients between the fixed and random effects' models were compared using the Hausman test with the null hypothesis "random effects are uncorrelated with the explanatory variables". The Hausman test results presented in Table 4.4 reveals that we do reject the null hypotheses for the return on

assets and return on equity models at 5% significance levels based on the calculated Chi-Square values. The panel fixed effects is found to be appropriate for return on assets and return on equity models after confirming that there is no cross-section dependency (see the appendix).

Interpretation

The microfinance banks profitability models indicate that the coefficients of automated teller machine are negative across the two indices of financial profitability of microfinance bank (see Table 4.4). This suggests that automated teller machine has negative effects on return on assets and return on equity measuring the profitability indicators of the selected microfinance banks in Nigeria. The financial implication is that as the number of automated teller machine increases, the microfinance firms recorded a decrease in return on equity and return on assets respectively. This means that improvement in this type of digital economy tools do not guarantee effective and efficient usage of the microfinance banks' equity and assets to generate profit. The signs of the automated teller machine were not in tandem with theoretical expectation. The study found that online banking has a direct and significant impact on return on assets at 10% level but the positive effect of online banking on return on equity is not significant at 5% level. Similarly, the direct impact of internet banking on microfinance profitability is only significant at 10% level. Concerning other digital economy tools, the study showed that point of sale and agent banking has no significance effect on microfinance profitability in Nigeria. In magnitude terms, it suggests that a 10% increase in the number of automated teller machine will reduces microfinance banks profitability measured by return on assets and return on equity by 8.84% and 7.88% respectively.

Table 4.4: Panel Fixed Effects Results of Digital Economy Tools and Micro-Finance Profitability

Variables	**Dependent Variable:** Micro-Finance Profitability	
	Return on Assets(log)	Return on Equity(log)
	1	2
Point of sale(log)	0.068	0.105
	(0.150)	(0.143)
Internet banking	0.632	0.873*
	(0.511)	(0.487)
Agent banking(log)	-0.138	-0.043
	(0.138)	(0.132)
Automated teller machine(log)	-0.884**	-0.788**
	(0.358)	(0.341)
Online banking	1.149*	0.896
	(0.611)	(0.583)
Firms size (log)	-0.175	-0.032
	(0.202)	(0.192)
Inflation rate	-0.041	-0.079*
	(0.049)	(0.047)
Interest rate	0.310*	0.232*
	(0.165)	(0.133)
Constant	-9.057**	-6.160*
	(3.922)	(3.170)
Within R-squared	0.222	0.238
F-Statistics	2.31	2.53
Prob.(F-Statistics)	(0.030)	(0.018)
Hausman Test	31.07	15.02
Prob.(Hausman Test)	0.000	0.036
Number of Firms	8	8
Observations	81	81

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10 significance level at 1%(2.576),5%(1.960) and 10%(1.645) respectively.

Source: Author's computation (2022) Extract from STATA output.

As for the other control variables, the parameters of firms size are negative and statistically insignificant at 5% in return on assets and return on equity models. It implies that firm size measured by total assets have no significant impact on financial profitability of the selected microfinance banks in Nigeria. Likewise, the study reveals that inflation have a negative impact on microfinance banks profitability indicators but only the effects of unstable price on return on equity is significant statistically at 10%. It was further confirmed from the result that low inflation has chances of improving microfinance bank profitability series such as return on assets and return on equity. The statistical significance of interest rate was confirmed in return on equity and return on assets models at 10% level. It suggests that higher interest on loans provided to the private sector by banks has a strong tie with the financial profitability of microfinance banks in Nigeria.

In addition, the degree of variation in return on assets and return on equity explained by point of sale, internet banking, agent banking, automated teller machine, online banking, firm size, inflation and interest are indicated in the adjusted within R-squared values which are relatively moderate. With F-statistics results, the statistics suggest that the overall effects of digital economy tools on financial profitability of microfinance banks measured by return on assets, and return on equity were significant at 5% as their probability values are less than 0.05.

Decision: The statistical significance of this model indicates that the study cannot accept the null hypothesis of this model hence the study accepted the alternate hypothesis which says that digital economy tools have significant effect on the financial profitability of the selected Nigerian microfinance banks. This result is consistent with a'priori expectation of this model. Thus, this study have achieved the objective of this model, answered the question as well as tested the related hypothesis.

Analysis of the Second Hypothesis

This sub-section reports the empirical results relating to the relationship between digital economy tools and deposit mobilization of micro-finance banks in Nigeria.

Correlation Analysis

The partial correlation coefficients of the financial indicators involving the relationship between digital economy tools and deposit mobilization of micro-finance banks are reported in Table 4.5. The correlation result indicates that total deposit negatively correlate with point of sale, agent banking, automated teller machine but positively related with internet banking, automated teller machine and online banking. Meanwhile, the results from the table indicate that depositors per staff has a negative correlation with digital economy tools indicators such as point of sales, internet banking, agent banking, automated teller machine and online banking. It implies that a negative level of association exist between digital economy tools and depositors per staff. It is also imperative to note that an indirect level of association was found between total deposit and depositors per staff.

Table 4.5: Correlation Matrix

	dps	pos	ibk	abk	atm	onbk	fs	inf	int
td	-0.211	-0.109	0.238	-0.086	0.376	0.225	0.921	0.054	-0.140
dps	1	-0.110	-0.060	-0.034	-0.162	-0.113	-0.026	0.098	-0.157
pos		1	0.319	0.093	0.270	0.370	-0.073	0.070	-0.145
ibk			1	0.243	0.503	0.812	0.277	0.233	-0.267
abk				1	0.585	0.281	-0.059	0.105	-0.183
atm					1	0.595	0.432	0.186	-0.260
onbk						1	0.247	0.177	-0.227
fs							1	0.128	-0.265
inf								1	0.119

Note: td - total deposit; dps - deposit per staff; pos - point of sale; ibk - internet banking; abk - agent banking; atm - automated teller machine; onbk - online banking; fs - firm size measured by natural log of total assets; inf- inflation rate; int - interest rate.
Source: Author's computation (2022).

With reference to other deposit mobilization of microfinance bank indicators, the correlation matrix showed that total deposit has positive correlation with firms size and inflation but negatively related with interest rate. Also, the correlation matrix shows that depositors per staff are positively connected with inflation whereas its level of association with firm size and interest rate is negative. Further, a positive correlation was established between digital economy tools variables. Table 4.5 also presents the correlation coefficients of microfinance banks' deposit mobilization and other controlling variables. The correlation matrix also shows the correlation coefficients among these other controlling factors of microfinance banks' deposit mobilization indices at different magnitudes and degrees. It is important to note that these correlation coefficients indicate the absence of multicollinearity problem which is avoided in the empirical analysis. Nevertheless, the results of the correlation coefficients are just preliminary analyses that are being put through confirmation in the next sub-section after considering other determinants of microfinance banks deposit mobilization.

Regression Analysis for the Second Hypothesis

In this section, this study employed the panel fixed and random effects' methods to estimate the panel regression models that examined the effect of digital economy tools (measured by point of sale, internet banking, agent banking, automated teller machine and online banking), other factors such firm size, inflation and interest rates on deposit mobilization of microfinance banks. As well, the section also reported two forms of estimated panel regression models relating to microfinance banks' deposit mobilization series. The augmented models that incorporates microfinance banks' deposit mobilization (using total deposits and depositors per staff) effects of digital economy tools and other control variables (firm size, inflation and interest rates) are reported in Models 1 and 2.

In addition, the estimated coefficients between the fixed and random effects' models were compared using the Hausman test with the null hypothesis "random effects are uncorrelated with the explanatory variables". The study found that the Hausman test results presented in Table 4.6 reject the null hypotheses for the total deposits and depositors per staff models at 5% significance levels based on the calculated Chi-Square values. The panel fixed effects estimator is appropriate for total deposits and depositors per staff models. The panel fixed effects model was found to be consistent and efficient for this sub-section after confirming that there is no cross-section dependence among the firms (see Appendix).

Table 4.6: Panel Fixed Effects Result of Digital Economy Tools and Deposit Mobilization

Variables	**Dependent Variable:** Deposit Mobilization of Micro-Finance Banks	
	Total Deposit(log)	Depositors per Staff(log)
	1	2
Point of sale(log)	0.161***	0.137**
	(0.041)	(0.063)
Internet banking	0.178	0.163
	(0.138)	(0.149)
Agent banking(log)	-0.121***	-0.132**
	(0.037)	(0.062)
Automated teller machine(log)	0.009	-0.033
	(0.097)	(0.104)
Online banking	-0.357**	0.049
	(0.165)	(0.178)
Firms size (log)	0.431***	0.193***
	(0.055)	(0.059)
Inflation rate	-0.007	0.020
	(0.013)	(0.014)
Interest rate	-0.108***	-0.042
	(0.038)	(0.041)
Constant	9.808***	5.520***
	(1.487)	(1.670)
Within R-squared	0.729	0.199
F-Statistics	21.84	4.37
Prob.(F-Statistics)	(0.000)	(0.000)
Hausman Test	71.03	52.90
Prob.(Hausman Test)	(0.000)	(0.000)
Number of Firms	8	8
Observations	81	81

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10 significance level at 1%(2.576),5%(1.960) and 10%(1.645) respectively.

Source: Author's computation (2022) Extract from STATA output.

Interpretation

In Table 4.6, the estimated microfinance banks' deposit mobilization models revealed that the coefficients of point of sales are positive in models 1 and 2 respectively. It suggests that point of sale has positive effects on total deposit and depositors per staff measuring the deposit mobilization indicators of the selected microfinance banks in Nigeria. The point of sales coefficients were in tandem with a'priori expectations in models 1-2. Just like point of sales, internet banking was found to positively influence total deposit and depositors per staff, albeit not statistically significant at 5% level. In magnitude terms, it suggests that a 10% increase in the numbers of point of sales will cause a rise in microfinance banks' total deposit and depositors per staff by 1.61%, and 1.37% respectively. Also, automated teller machine positively impacted total deposits but inversely related with depositors per staff. However, the probability values of their t-statistics results were insignificant statistically at 5% level. The financial deposit implication is that as the numbers of point of sales increases, the microfinance firms recorded an increase in total deposit and depositors per staff respectively.

Furthermore, this finding shows that agent banking negatively impacted on total deposit and depositors per staff of the selected microfinance banks in Nigeria. Their t-statistics values indicate that the indirect impact of agent banking is significant statistically at 5% level. Thus, it means that agent banking do not assure a stable and dependable client base in terms of total deposits and depositors per staff for microfinance banks. Total deposits and operating income decreases by 1.21% and 1.32% correspondingly, due to 10% increase in agent banking. Also, with the existence of online banking, the selected microfinance firms have a low deposit but a higher chance of depositors per staff, although not statistically significant at 5%. The automated

teller machine parameters in models 1 and 2 shows that microfinance banks deposit mobilization measured by total deposits and depositors per staff is not statistically significant.

Concerning the other explanatory variables, the parameters of firms' size are positive and statistically significant at 5% in total deposits and depositors pr staff models. This means that the size of firms with respect to their assets significantly impacted their deposits and depositors per staff of the selected microfinance banks in Nigeria. On the contrary, the study reveals that low interest rate significantly increases total deposits but the impact on depositors per staff is not statistically confirmed. Further, it was detected that inflation has no significant impact on total deposits and depositors per staff.

Additionally, the extent of variation in total deposits and depositors per staff explained by digital economy tools (measured by point of sale, internet banking, agent banking, automated teller machine and online banking), other factors such firm size, inflation and interest rates are presented in the adjusted within R-squared values which are relatively moderate. With the F-statistics, the statistics suggest that the overall effects of digital economy tools on deposit mobilization of microfinance banks measured by total deposits and depositors per staff were significant at 5% as their probability values are less than 0.05.

Decision: The statistical significance of this model indicates that the study cannot accept the null hypothesis of this model hence the study accepted the alternate hypothesis which says that digital economy tools have significant effect on the deposit mobilization of the selected Nigerian microfinance banks. This result is consistent with a'priori expectation of this model. Thus, this study have achieved the objective of this model, answered the question as well as tested the related hypothesis.

Analysis of the Third Hypothesis

In this sub-section, the empirical results concerning to the effect of digital economy tools on micro-finance bank branches in Nigeria is reported.

Correlation Analysis

Table 4.7 presents the partial correlation coefficients of the variables relating to the relationship among digital economy tools and micro-finance bank branches in Nigeria. The coefficient of correlation result shows that point of sales, internet banking, agent banking, automated teller machine, and online banking have negative level of association with microfinance bank branches. This implies that digital economy tools have an indirect correlation with micro-finance bank branches. Concerning micro-finance bank branches with other controlling variables, the correlation table shows that micro-finance bank branches positively correlate with firm size and inflation rate but negatively related with interest rates. Pertaining to the main explanatory variables, there is a direct relationship found between all the indices of digital economy tools (measured by point of sale, internet banking, agent banking, automated teller machine and online banking).

Table 4.7: Correlation Matrix

	pos	ibk	abk	atm	onbk	fs	inf	int
mbb	-0.180	-0.171	-0.071	-0.122	-0.095	0.040	0.074	-0.108
pos	1	0.319	0.093	0.270	0.370	-0.073	0.070	-0.145
ibk		1	0.243	0.503	0.812	0.277	0.233	-0.267
abk			1	0.585	0.281	-0.059	0.105	-0.183
atm				1	0.595	0.432	0.186	-0.260
onbk					1	0.247	0.177	-0.227
fs						1	0.128	-0.265
inf							1	0.119

Note: mbb - number of microfinance banks; pos - point of sale; ibk - internet banking; abk - agent banking; atm - automated teller machine; onbk - online banking; fs - firm size measured by natural log of total assets; inf- inflation rate; int - interest rate.
Source: Author's computation (2022).

With reference to the relationship between digital economy tools and other control variable, firm size has a positive relationship with, internet banking, automatic teller machine, and online banking but negatively associated with point of sale and agent banking. Inflation has a direct correlate with point of sale, internet banking, agent banking, automatic teller machine, and online banking. As to interest rate, it negatively correlates with point of sale, internet banking, agent banking, automatic teller machine, and online banking. Table 4.7 also presents the correlation coefficients of microfinance banks branches and other controlling variables. The correlation matrix table also shows the correlation coefficients among these other controlling factors of microfinance banks branches at different magnitudes and degrees. The values of the correlation coefficients revealed the absence of multicollinearity problem. Thus, the problem of multicollinearity is avoided in the empirical analysis. Nevertheless, the results of the correlation coefficients are just preliminary analyses that are being put through confirmation in the next sub-section after considering other determinants of microfinance banks branches.

Regression Analysis for the Third Hypothesis

The panel fixed and random effects' methods were employed in estimating the panel regression models that examined the effects of digital economy tools (measured by point of sale, internet banking, agent banking, automated teller machine and online banking), other factors such firm size, inflation and interest rates on microfinance bank branches measured by number of microfinance bank branches. As well, an estimated panel regression model was estimated based on the microfinance bank branches. The model regresses microfinance bank branches on digital economy tools (measured by point of sale, internet banking, agent banking, automated teller machine and online banking), other factors such firm size, inflation and interest rates correspondingly.

As earlier stated in previous sub-sections, the estimated coefficients between the fixed and random effects' models were compared using the Hausman test with the null hypothesis "random effects are uncorrelated with the explanatory variables". The Hausman test results presented in Table 4.8 reveals that we do reject the null hypotheses for microfinance bank branches models at 5% significance levels based on the calculated Chi-Square values. The panel fixed effects is found to be appropriate for microfinance bank branches models. However, the null hypothesis of the Hausman tests for microfinance bank branches were not rejected at 5% significance level. As a result, the panel fixed effects method was found to be consistent and efficient for the achieving the stated objective of this sub-section after confirming that there is no cross-section dependence at 5% significance level (see Appendix).

Interpretation

Besides, the estimated microfinance bank branches model in Table 4.8 indicates that the coefficient of point of sales is positive and significant at 5% level. This means that point of sale has positive effects on bank branches of microfinance firms in Nigeria. The sign of the point of sale is in tandem with theoretical expectations. Similarly, agent banking positively influences micro-finance bank branches. Just as point of sale and agent banking, automated teller machine has a positive impact on the numbers of micro-finance bank branches. In magnitude terms, it shows that a 10% increase in point of sale, agent banking and automated teller machine drive microfinance bank branches by 0.71%, 0.87% and 1.46% respectively. Conversely, the probability value of the t-statistics results of automated teller machine was significant statistically at 10% level. On the second hand, internet banking and online banking have a negative effect on microfinance bank branches but not significant statistically at 5% level.

Table 4.8: Panel Fixed Result of Digital Economy Tools and Micro-Finance Bank Branches

Variables	**Dependent Variable:** Micro-Finance Banks Branches
	Number of Micro-Finance Bank Branches(log)
	1
Point of sale(log)	0.071**
	(0.033)
Internet banking	-0.075
	(0.112)
Agent banking(log)	0.087***
	(0.030)
Automated teller machine(log)	0.146*
	(0.079)
Online banking	-0.116
	(0.134)
Firms size (log)	0.276***
	(0.044)
Inflation rate	-0.002
	(0.011)
Interest rate	-0.028
	(0.031)
Constant	-2.162*
	(1.208)
Within R-squared	0.774
F-Statistics	27.76
Prob.(F-Statistics)	(0.000)
Hausman Test	69.83
Prob.(Hausman Test)	(0.000)
Number of Firms	8
Observations	81

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10 significance level at 1%(2.576),5%(1.960) and 10%(1.645) respectively.

Source: Author's computation (2022) Extract from STATA output.

In respect of the control variables, the parameter of firms' size is positive and statistically significant at 5% level. This further implies that firm sizes have significant impact on microfinance bank branches of the selected microfinance banks in Nigeria. Also, the study reveals that low inflation and interest rate tends to improve microfinance bank branches, albeit not statistically significant at 5% level. The joint effects of the variables were also examined using the F-statistics test. They found that the overall effects of digital economy tools on microfinance bank branches were significant at 5% as their probability values are less than 0.05. In addition, the degree of variation in microfinance bank branches indicated that the adjusted within R-squared values are relatively moderate. This indicates that point of sale, internet banking, agent banking, automated teller machine and online banking were found to account for about 77.4% of the total variation in microfinance bank branches of the selected Nigerian microfinance banks between 2010 and 2020 respectively.

Decision: The statistical significance of this model indicates that the study cannot accept the null hypothesis of this model hence the study accepted the alternate hypothesis which says that digital economy tools have significant effects on the number of branches of microfinance banks in Nigeria. This result is consistent with a'priori expectation of this model. Thus, this study have achieved the objective of this model, answered the question as well as tested the related hypothesis.

Analysis of the Fourth Hypothesis

This sub-section reports the empirical results with reference to the effect of digital economy tools on loan disbursement of microfinance banks in Nigeria.

Correlation Analysis

Table 4.9 presents the partial correlation coefficients of the variables relating to the relationship among digital economy tools and micro-finance bank loan disbursement in Nigeria. The coefficient of correlation result shows that point of sales, internet banking, agent banking, automated teller machine, and online banking have negative level of association with microfinance bank loan disbursement. It means that digital economy tools have an indirect correlation with micro-finance bank loan disbursement. Pertaining to the micro-finance bank loan disbursement with other controlling variables, the correlation table shows that micro-finance bank loan disbursement negatively correlate with firm size, inflation rate and interest rates. With reference to the main explanatory variables, there is a direct relationship found between all the indices of digital economy tools (measured by point of sale, internet banking, agent banking, automated teller machine and online banking).

Table 4.9: Correlation Matrix

	pos	ibk	abk	atm	onbk	fs	inf	int
bps	-0.262	-0.357	-0.192	-0.304	-0.487	-0.083	-0.037	-0.010
pos	1	0.319	0.093	0.270	0.370	-0.073	0.070	-0.145
ibk		1	0.243	0.503	0.812	0.277	0.233	-0.267
abk			1	0.585	0.281	-0.059	0.105	-0.183
atm				1	0.595	0.432	0.186	-0.260
onbk					1	0.247	0.177	-0.227
fs						1	0.128	-0.265
inf							1	0.119

Note: bps - borrowers per staff; pos - point of sale; ibk - internet banking; abk - agent banking; atm - automated teller machine; onbk - online banking; fs - firm size measured by natural log of total assets; inf- inflation rate; int - interest rate.
Source: Author's computation (2022).

In connection with the relationship between digital economy tools and other control variable, firm size has a positive relationship with, internet banking, automatic teller machine, and online banking but negatively associated with point of sale and agent banking. Inflation has a direct correlate with point of sale, internet banking, agent banking, automatic teller machine, and online banking. As to interest rate, it negatively correlates with point of sale, internet banking, agent banking, automatic teller machine, and online banking. Table 4.9 also presents the correlation coefficients of microfinance banks loan disbursement and other controlling variables. The correlation matrix table also shows the correlation coefficients among these other controlling factors of microfinance banks loan disbursement at different magnitudes and degrees. The values of the correlation coefficients revealed the absence of multicollinearity problem. Thus, the problem of multicollinearity is avoided in the empirical analysis. Nevertheless, the results of the correlation coefficients are just preliminary analyses that are being put through confirmation in the next sub-section after considering other determinants of microfinance banks loan disbursement.

Regression Analysis for the Fourth Hypothesis

The panel fixed and random effects' methods were employed in estimating the panel regression models that examined the effects of digital economy tools (measured by point of sale, internet banking, agent banking, automated teller machine and online banking), other factors such firm size, inflation and interest rates on microfinance bank loan disbursement. As well, an estimated panel regression models was estimated based on the microfinance loan disbursement. The model regresses microfinance bank loan disbursement on digital economy tools (measured by point of sale, internet banking, agent banking, automated teller machine and online banking), other factors such firm size, inflation and interest rates correspondingly.

As earlier stated in previous sub-sections, the estimated coefficients between the fixed and random effects' models were compared using the Hausman test with the null hypothesis

"random effects are uncorrelated with the explanatory variables". The Hausman test results presented in Table 4.10 reveals that we do reject the null hypotheses for microfinance bank loan disbursement models at 5% significance levels based on the calculated Chi-Square values. The panel fixed effects is found to be appropriate for microfinance bank loan disbursement models. However, the null hypothesis of the Hausman tests for microfinance bank loan disbursement was not rejected at 5% significance level. As a result, the panel fixed effects method was found to be consistent and efficient for the achieving the stated objective of this sub-section after confirming that there is no cross-section dependence at 5% significance level (see Appendix).

Interpretation

Besides, the estimated microfinance loan disbursement model in Table 4.10 indicates that the coefficient of point of sales is positive and significant at 5% level. This means that point of sale has positive effects on loan disbursement of microfinance firms in Nigeria. The sign of the point of sale is in tandem with theoretical expectations. Similarly, internet banking positively influences micro-finance bank branches. Just as point of sale and internet banking, automated teller machine has a positive impact on the numbers of micro-finance loan disbursement. In magnitude terms, it shows that a 10% increase in point of sale, internet banking and automated teller machine drive microfinance bank loan disbursement by 0.58%, 2.19% and 0.48% respectively. Conversely, the probability value of the t-statistics results of automated teller machine was not significant statistically at 5% level. On the second hand, agent banking and online banking have a negative effect on microfinance bank loan disbursement but not significant statistically at 5% level.

Table 4.10: Panel Fixed Effects Result of Digital Economy Tools and Loan Disbursement of Micro-Finance Banks

Variables	**Dependent Variable:** Loan Disbursement of Micro-Finance
	Borrowers per Staff
	1
Point of sale	0.058**
	(0.027)
Internet banking	0.219**
	(0.093)
Agent banking	-0.116***
	(0.025)
Automated teller machine	0.048
	(0.065)
Online banking	-0.312***
	(0.111)
Firms size	0.122***
	(0.037)
Inflation rate	-0.003
	(0.009)
Interest rate	-0.025
	(0.025)
Constant	2.704***
	(0.999)
Within R-squared	0.397
F-Statistics	5.34
Prob.(F-Statistics)	(0.000)
Hausman Test	62.27
Prob.(Hausman Test)	(0.000)
Number of Firms	8
Observations	81

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.10 significance level at 1%(2.576), 5%(1.960) and 10%(1.645) respectively.
Source: Author's computation (2022) Extract from STATA output.

With respect to the control variables, the parameter of firms' size is positive and statistically significant at 5% level. This further implies that firm sizes have significant impact on microfinance bank loan disbursement of the selected microfinance banks in Nigeria. Also, the study reveals that low inflation and interest rate tends to improve microfinance bank loan disbursement, albeit not statistically significant at 5% level. The joint effects of the variables were also examined using the F-statistics test. They found that the overall effects of digital economy tools on microfinance bank loan disbursement were significant at 5% as their probability values are less than 0.05. In addition, the degree of variation in microfinance bank loan disbursement indicated that the adjusted within R-squared values are relatively moderate. This indicates that point of sale, internet banking, agent banking, automated teller machine and online banking were found to account for about 77.4% of the total variation in microfinance bank loan disbursement of the selected Nigerian microfinance banks between 2010 and 2020 respectively.

Decision: The statistical significance of this model indicates that the study cannot accept the null hypothesis of this model hence the study accepted the alternate hypothesis which says that digital economy tools have significant effects on the loan disbursement of microfinance banks in Nigeria. This result is consistent with a'priori expectation of this model. Thus, this study have achieved the objective of this model, answered the question as well as tested the related hypothesis.

Discussion of Findings

For the first objective, the findings show that automated teller machine has a negative and significant impact on return on assets and return on equity which were used as measurements of microfinance bank profitability in Nigeria. It shows that the operation of automated teller machine cause a strain on the microfinance profitability by its assets. Online banking significantly and positively direct return on assets, whereas, internet banking directly and significantly impact return on equity at 10% significance level. It aligns with the study conducted for 30 European countries that a strong relationship exists between internet banking and bank performance[1]. Similarly, the result aligns with a study conducted for financial institutions in Vietnam that that internet banking had an effect on bank profitability through an increase of income from service activities[2]. The empirical results from questionnaire administered to the people of Kenya found that digital finance has positive influence on bank incomes[3]. A similar outcome is derived between a strong positive relationship between the financial performance of commercial banks and electronic banking in Kenya[4]. This goes with a study that found the four e-payment instruments like ATM, WEB, POS and Mobile banking influenced return on assets in some selected Nigerian Deposits Money Banks[5,6,7,8,9,10,11]. For point of sale and agent banking, their impacts on financial profitability of micro-finance banks are not statistically confirmed. It does not support the result that POS positively contributed to bank profitability[12].

Concerning the second objective, the study showed that point of sale positively and significantly deposits mobilization which is measured by total deposit and depositors per staff. It goes in lines with the findings of previous studies that argued for a point of sales is positively related to total bank deposits in Nigeria for the period of 2009 and 2017[13]. Likewise, it aligns with a study in Kenya that argued that digital finance has positive influence on bank incomes[12]. However, agent banking has a negative effect on deposit

mobilization within the periods understudy. Similarly, it was discovered that online banking indirectly impacted total deposits of microfinance banks. As to internet banking, and automated teller machine, they have no significant impact on deposit mobilization of microfinance banks in Nigeria. This contradicts the results that total bank deposit is driven significantly by automated teller machine and other electronic products like Web pay and Mobile Pay in Nigeria[13].

As to the third objective, point of sale, agent banking and automated teller machine positively influence microfinance bank branches in Nigeria. The negative influence of internet banking and online banking on microfinance bank branches is not statistically significant at 5% level. Regarding the fourth objective, point of sale and internet banking had positive impact on loan disbursement of microfinance banks in Nigeria. However, agent banking and online banking negatively affect loan disbursement of microfinance banks in Nigeria. The positive impact of automated teller machine on the loan disbursement of microfinance banks is not significant at 5% level.

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Chapter Five

Conclusion

This chapter presents the concluding remarks of the research study. It is divided into three parts, namely summary of findings, conclusion and recommendations.

Summary

In this study, the existing relationship between digital economy tools and the growth of selected micro-finance banks in Nigeria is investigated in order to understand the effect of digital economy tools on the business profitability of micro-finance banks regarding their return on assets and return on equity in Nigeria; the impact of digital economy tools on deposit mobilization of micro-finance banks in Nigeria; the effect of digital economy tools on micro-finance bank branches in Nigeria; and the impact of digital economy tools on loan disbursement of micro-finance banks in Nigeria. Understudying this research study became necessary because it makes enquiries on the findings of past studies which can best be described as inconclusive. The study is conducted for microfinance banks in the developing countries such as Nigeria. The datasets employed were obtained from the selected companies' annual reports for different years and the scope of the study spans from 2010 to 2020. The panel fixed effects estimator was used to evaluate the parameters based on the characteristics of the datasets and the Hausman test results.

For the first objective, automated teller machine has negative effects on return on assets and return on equity measuring the profitability indicators of the selected microfinance banks in Nigeria. The financial implication is that as the number of automated teller machine increases, the microfinance firms recorded a decrease in return on equity and return on assets respectively. This means that improvement in this type of digital economy tools do not guarantee effective and efficient usage of the microfinance banks' equity and assets to

generate profit. The signs of the automated teller machine were not in tandem with theoretical expectation. The study found that online banking has a direct and significant impact on return on assets at 10% level but the positive effect of online banking on return on equity is not significant at 5% level. Similarly, the direct impact of internet banking on microfinance profitability is only significant at 10% level. Concerning other digital economy tools, the study showed that point of sale and agent banking has no significance effect on microfinance profitability in Nigeria.

Regarding the second objective, point of sale has positive effects on total deposit and depositors per staff measuring the deposit mobilization indicators of the selected microfinance banks in Nigeria. Just like point of sales, internet banking was found to positively influence total deposit and depositors per staff, albeit not statistically significant at 5% level. Also, automated teller machine positively impacted total deposits but inversely related with depositors per staff but not significant statistically at 5% level. Agent banking negatively impacted on total deposit and depositors per staff of the selected microfinance banks in Nigeria. It means that agent banking do not assure a stable and dependable client base in terms of total deposits and depositors per staff for microfinance banks. Also, with the existence of online banking, the selected microfinance firms have a low deposit but a higher chance of depositors per staff, although not statistically significant at 5%.

Concerning the third objective, point of sale has positive effects on bank branches of microfinance firms in Nigeria. The sign of the point of sale is in tandem with theoretical expectations. Similarly, agent banking positively influences micro-finance bank branches. Just as point of sale and agent banking, automated teller machine has a positive impact on the numbers of micro-finance bank branches. Conversely, the probability value of the t-statistics results of automated teller machine was significant statistically at 10% level. In contrast,

internet banking and online banking have a negative effect on microfinance bank branches but not significant statistically at 5% level.

As to the fourth objective, point of sale has positive effects on loan disbursement of microfinance firms in Nigeria. The sign of the point of sale is in tandem with theoretical expectations. Similarly, internet banking positively influences micro-finance bank branches. Just as point of sale and internet banking, automated teller machine has a positive impact on the numbers of micro-finance loan disbursement. Equally, the probability value of the t-statistics results of automated teller machine was not significant statistically at 5% level. Then again, agent banking and online banking have a negative effect on microfinance bank loan disbursement but not significant statistically at 5% level.

Conclusion

This study investigates the interrelationship between digital economy tools and micro-finance banks' growth in Nigeria over the periods of 2010 to 2020 using the panel fixed effects approach. The study discovered that automated teller machine has a negative and significant impact on return on assets and return on equity which were used as measurements of microfinance bank profitability in Nigeria. Online banking significantly and positively direct return on assets, whereas, internet banking directly and significantly impact return on equity. For point of sale and agent banking, their impacts on financial profitability of micro-finance banks are not statistically confirmed. The study showed that point of sale positively and significantly deposits mobilization which is measured by total deposit and depositors per staff. However, agent banking has a negative effect on deposit mobilization within the periods understudy. Internet banking and automated teller machine have no significant impact on deposit mobilization of microfinance banks in Nigeria. Point of sale, agent banking and automated teller machine positively influenced microfinance bank branches in Nigeria.

Meanwhile, point of sale and internet banking had positive impact on loan disbursement of microfinance banks in Nigeria. However, agent banking and online banking negatively affect loan disbursement of microfinance banks in Nigeria. This study emphasized the importance of digital economy tools in improving the growth of microfinance banks in Nigeria in respect of their profit, loan disbursement, bank branches and deposit mobilization.

Recommendations

Following the reported findings discussed in the subsequent parts of the chapter in this research study, the following policy recommendations are discussed below:

a) The microfinance institutions need to revise their digital tools procedures and policies to increase their deposit, loan disbursement and profit. Also, the government has to intervene and support their digital economy tools operation so as to make them financially viable and strong to improve the growth of microfinance banks.
b) Specifically, there is need for outreach of microfinance banks since digitization has undoubtedly increased in terms of its operations, clients and loan disbursement but it has not been able to capture giant market share.
c) Government needs to play a proactive role by ensuring provision of funds for productive and developmental activities to fully utilize gains of digitization. These banks must also decide whether a particular technology is viable in that area and if so, how it should be tailored to meet specific needs of people they wish to serve. Further, need is to create confidence among stakeholders through a strong legal framework for strengthening microfinance banks to achieve growth.

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Appendix

c_id	Firms	Years	roa	roe	td	dps	mbb	bps	pos	ibk	abk	atm	onbk	fs	inf	int
1	Accion	2010	0.287288	0.077289	1939094	210	10	113	0	0	0	0	0	513446000	13.7202	17.585
1	Accion	2011	0.317451	0.119561	2661958	270	12	156	0	0	0	0	0	804871000	10.84003	16.02
1	Accion	2012	0.306582	0.134526	3479411	330	16	113	0	0	0	0	0	1050010000	12.21778	16.79167
1	Accion	2013	0.136042	0.153619	6616043	116	19	113	0	0	0	0	0	3025690000	8.475827	16.7225
1	Accion	2014	0.078915	0.135028	7748333	129	23	124	0	0	0	0	0	5709969000	8.062486	16.54833
1	Accion	2015	0.07931	0.179457	10660025	150	31	134	298	1	0	8	1	6789014000	9.009387	16.84917
1	Accion	2016	0.092878	0.208391	6619057	163	48	86	293	1	105	11	1	7538090000	15.67534	16.86802
1	Accion	2017	0.157617	0.352973	6646053	188	68	102	84	1	256	8	1	8746431000	16.52354	17.55333
1	Accion	2018	0.141206	0.337325	7726431	224	50	86	40	1	486	8	1	11012082000	12.09473	16.9039
1	Accion	2019	0.109694	0.255461	4013511	230	77	91	40	1	486	8	1	12216158000	11.39679	15.37659
1	Accion	2020	0.000525	0.001261	4309677	119	77	112	40	1	486	8	1	12881605000	13.24602	13.64202
2	AB Microfinance	2010	0.047357	0.035658	1316507	61	5	37	0	0	0	0	0	2390655000	13.7202	17.585
2	AB Microfinance	2011	0.024814	0.087346	2766023	61	8	78	0	0	0	0	0	4666657000	10.84003	16.02
2	AB Microfinance	2012	0.023914	0.089846	3281005	71	11	72	0	0	0	0	0	5012590000	12.21778	16.79167
2	AB Microfinance	2013	0.01354	0.084596	4679256	88	14	83	59	1	12	1	1	8926010000	8.475827	16.7225
2	AB Microfinance	2014	0.017241	0.112292	5738757	99	15	83	65	1	12	1	1	9883809000	8.062486	16.54833
2	AB Microfinance	2015	0.017805	0.105197	7329980	123	15	95	73	1	12	1	1	10403643000	9.009387	16.84917
2	AB Microfinance	2016	0.02065	0.090795	7198800	144	16	87	81	1	12	1	1	11882562000	15.67534	16.86802
2	AB Microfinance	2017	0.03806	0.123015	6203789	168	20	83	90	1	12	1	1	12277515000	16.52354	17.55333
2	AB Microfinance	2018	0.037624	0.121182	9369094	186	21	87	432	1	12	1	1	12551891000	12.09473	16.9039
2	AB Microfinance	2019	0.038798	0.131351	9837549	190	21	90	432	1	12	1	1	13641765000	11.39679	15.37659
2	AB Microfinance	2020	0.036171	0.136637	10329426	193	21	92	432	1	12	1	1	15738533000	13.24602	13.64202
3	BAOBAB Microfinance	2010													13.7202	17.585

3	BAOBAB Microfinance	2011													10.84003	16.02
3	BAOBAB Microfinance	2012													12.21778	16.79167
3	BAOBAB Microfinance	2013	0.042414	0.209478	2123351	136	7	71	0	1	0	1	1	121370901	8.475827	16.7225
3	BAOBAB Microfinance	2014	0.045579	0.225106	1992933	159	6	75	0	1	0	1	1	122544951	8.062486	16.54833
3	BAOBAB Microfinance	2015	0.041343	0.204189	1812946	186	6	90	0	1	0	1	1	125173786	9.009387	16.84917
3	BAOBAB Microfinance	2016	0.016572	0.081844	1982678	148	10	77	10	1	10	1	1	222007053	15.67534	16.86802
3	BAOBAB Microfinance	2017	0.021205	0.104727	1908846	148	10	77	10	1	10	2	1	227082810	16.52354	17.55333
3	BAOBAB Microfinance	2018	0.029237	0.144398	5306043	164	20	74	20	1	20	2	1	347339067	12.09473	16.9039
3	BAOBAB Microfinance	2019	0.032518	0.160603	9103780	150	24	75	20	1	20	2	1	460451000	11.39679	15.37659
3	BAOBAB Microfinance	2020	0.035757	0.176597	13007560	190	27	100	24	1	20	2	1	555882600	13.24602	13.64202
4	LAPO MFB	2010	0.324461	0.324461	33802000	139	230	190	0	0	0	0	0	47427024	13.7202	17.585
4	LAPO MFB	2011	0.027663	0.027663	43239531	222	268	297	0	0	0	0	0	1923511346	10.84003	16.02
4	LAPO MFB	2012	0.027396	0.027396	62715664	280	302	353	0	0	0	0	0	2027975838	12.21778	16.79167
4	LAPO MFB	2013	0.032323	0.032323	86611729	326	321	373	0	0	0	0	0	2102132931	8.475827	16.7225
4	LAPO MFB	2014	0.032289	0.032289	1.11E+08	334	385	341	0	0	0	0	0	2872810011	8.062486	16.54833
4	LAPO MFB	2015	0.158878	0.230248	1.29E+08	352	386	309	0	0	0	0	0	5400282796	9.009387	16.84917
4	LAPO MFB	2016	0.164538	0.207617	90967189	426	386	283	0	0	0	0	0	5928943673	15.67534	16.86802
4	LAPO MFB	2017	0.130296	0.166399	79590237	464	474	275	0	1	1	0	1	7659640399	16.52354	17.55333
4	LAPO MFB	2018	0.140917	0.186704	84612618	578	495	184	0	1	10	0	1	9260648541	12.09473	16.9039
4	LAPO MFB	2019	0.31179	0.421682	1.47E+08	578	495	230	0	1	14	0	1	11592350411	11.39679	15.37659
4	LAPO MFB	2020	0.285825	0.387916	1.47E+08	500	495	200	0	1	19	0	1	13162414554	13.24602	13.64202
5	Grooming Centre	2010	0.016025	0.036217	8572000	230	113	210	0	0	0	0	0	2958000000	13.7202	17.585
5	Grooming Centre	2011	0.016025	0.036217	10631837	270	160	250	0	0	0	0	0	5136604000	10.84003	16.02
5	Grooming Centre	2012	0.016025	0.036217	16482866	300	190	280	0	0	0	0	0	8960647200	12.21778	16.79167
5	Grooming Centre	2013	0.016025	0.036217	20007741	350	254	328	0	0	0	0	0	12386425100	8.475827	16.7225
5	Grooming Centre	2014	0.016025	0.036217	27469095	400	330	330	0	0	0	0	0	18313200500	8.062486	16.54833

5	Grooming Centre	2015	0.016025	0.036217	34942703	400	410	366	0	0	0	0	0	23818770500	9.009387	16.84917
5	Grooming Centre	2016	0.016025	0.036217	30528945	400	500	336	0	0	0	0	0	21645462800	15.67534	16.86802
5	Grooming Centre	2017	0.016025	0.036217	30035003	350	538	339	0	0	0	0	0	31971400300	16.52354	17.55333
5	Grooming Centre	2018	0.016025	0.036217	37429702	340	577	351	0	0	0	0	0	42565943700	12.09473	16.9039
5	Grooming Centre	2019	0.016025	0.036217	48373800	310	600	300	2	1	2	5	1	52941724000	11.39679	15.37659
5	Grooming Centre	2020	0.016025	0.036217	52331226	290	605	260	2	1	3	5	1	66980630400	13.24602	13.64202
6	Hasal MFB	2010	0.000548	0.00183	1.68E+09	50	6	101	0	0	0	0	0	1977287000	13.7202	17.585
6	Hasal MFB	2011	0.001499	0.006272	1.89E+09	60	12	108	0	0	0	0	0	2479365000	10.84003	16.02
6	Hasal MFB	2012	0.001361	0.0059	1.98E+09	62	20	136	0	0	0	0	0	2723772000	12.21778	16.79167
6	Hasal MFB	2013	0.065284	0.239643	1.87E+09	100	22	160	0	0	0	0	0	3007477000	8.475827	16.7225
6	Hasal MFB	2014	0.079202	0.246636	1.92E+09	81	27	122	5	1	0	2	1	3599745000	8.062486	16.54833
6	Hasal MFB	2015	0.067109	0.204254	2.13E+09	98	22	229	9	1	0	3	1	4196881000	9.009387	16.84917
6	Hasal MFB	2016	0.048822	0.163834	2.8E+09	100	18	158	20	1	0	4	1	5850582000	15.67534	16.86802
6	Hasal MFB	2017	0.002222	0.006015	2.53E+09	110	18	133	20	1	0	4	1	5896192000	16.52354	17.55333
6	Hasal MFB	2018	0.001799	0.005016	2.59E+09	130	18	139	0	0	0	0	0	5967617000	12.09473	16.9039
6	Hasal MFB	2019	0.024545	0.064973	2.85E+09	142	18	150	0	0	0	0	0	5999268000	11.39679	15.37659
6	Hasal MFB	2020													13.24602	13.64202
7	Advance Lafayette	2010													13.7202	17.585
7	Advance Lafayette	2011													10.84003	16.02
7	Advance Lafayette	2012													12.21778	16.79167
7	Advance Lafayette	2013	0.076878	0.076976	2.23E+10	41	8	40	1	0	0	1	1	31510607800	8.475827	16.7225
7	Advance Lafayette	2014	0.077537	0.077643	2.68E+10	40	8	45	1	1	0	0	0	35551795300	8.062486	16.54833
7	Advance Lafayette	2015	0.196021	0.196619	3.21E+10	70	8	78	1	1	0	0	0	49598227000	9.009387	16.84917
7	Advance Lafayette	2016	0.169977	0.176705	3.85E+10	81	8	79	1	1	0	1	1	84332357900	15.67534	16.86802
7	Advance Lafayette	2017	0.171249	0.180384	4.63E+10	105	10	91	1	1	0	2	1	1.02459E+11	16.52354	17.55333
7	Advance Lafayette	2018	0.108055	0.120214	5.55E+10	117	11	70	1	1	0	5	1	1.17775E+11	12.09473	16.9039

7	Advance Lafayette	2019	0.158431	0.179779	6.66E+10	190	16	89	1	1	0	8	1	1.42011E+11	11.39679	15.37659
7	Advance Lafayette	2020	0.00118	0.001429	7.99E+10	211	16	100	1	1	0	10	1	1.77591E+11	13.24602	13.64202
8	NPF Microfinance	2010	0.037638	0.07054	2389029	120	28	120	0	0	0	0	0	6434435000	13.7202	17.585
8	NPF Microfinance	2011	0.026643	0.051864	3714000	142	28	142	0	0	0	0	0	6542627000	10.84003	16.02
8	NPF Microfinance	2012	0.088004	0.178049	3706000	170	28	170	0	0	0	0	0	7790984000	12.21778	16.79167
8	NPF Microfinance	2013	0.058991	0.130735	5065000	193	28	193	0	0	0	0	0	8680638000	8.475827	16.7225
8	NPF Microfinance	2014	0.056834	0.151354	6613000	213	28	213	0	0	0	0	0	10865189000	8.062486	16.54833
8	NPF Microfinance	2015	0.055854	0.162037	6472038	250	28	250	0	0	0	0	0	12334021000	9.009387	16.84917
8	NPF Microfinance	2016	0.064993	0.180006	6213269	259	28	259	0	1	0	0	0	12361872000	15.67534	16.86802
8	NPF Microfinance	2017	0.051392	0.17251	8762200	280	35	280	0	1	0	0	0	15952341000	16.52354	17.55333
8	NPF Microfinance	2018	0.016318	0.061799	10465119	300	35	300	0	1	0	0	0	17597552000	12.09473	16.9039
8	NPF Microfinance	2019	0.051471	0.189191	11327058	310	36	310	0	1	0	0	0	19583717000	11.39679	15.37659
8	NPF Microfinance	2020	0.034546	0.158168	14838805	300	36	300	0	1	0	0	0	25096975000	13.24602	13.64202

Note: roa - return on assets; roe - return on equity; td - total deposit (₦'Billion); dps - depositors per staff; mbb - no. of microfinance bank branches; bps - borrowers per staff; pos - point of sale; ibk - internet banking; abk - agent banking; atm - automated teller machine; onbk - online banking; fs - firm size measured by natural log of total assets; inf- inflation rate; int - interest rate.

Source: Company's Annual Report (various years)

Objective I

. xtreg roa pos ibk abk atm onbk fs inf intt, fe

```
Fixed-effects (within) regression               Number of obs      =        81
Group variable: c_id                            Number of groups   =         8

R-sq:                                           Obs per group:
     within = 0.2216                                         min =         8
     between = 0.0097                                        avg =      10.1
     overall = 0.0488                                        max =        11

                                                F(8,65)           =      2.31
corr(u_i, Xb)  = -0.4575                        Prob > F          =    0.0300

------------------------------------------------------------------------------
         roa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |   .0678309   .1499597     0.45   0.653    -.2316593    .3673211
         ibk |   .6315266   .5111434     1.24   0.221    -.3892974    1.652351
         abk |  -.1384383    .138382    -1.00   0.321    -.4148063    .1379297
         atm |  -.8835295   .3580378    -2.47   0.016     -1.59858   -.1684787
        onbk |   1.149012   .6114276     1.88   0.065    -.0720929    2.370118
          fs | -.1747033   .2018412    -0.87   0.390     -.577808    .2284013
         inf | -.0405211   .0490251    -0.83   0.412    -.1384309    .0573887
        intt |  .1833257   .1393563     1.32   0.193     -.094988    .4616394
       _cons |  -2.327079   5.495193    -0.42   0.673    -13.30174    8.647579
-------------+----------------------------------------------------------------
     sigma_u | 1.1402037
     sigma_e |  1.10864
         rho |  .51403274   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(7, 65) = 7.05                     Prob > F = 0.0000
```

```
. estimates store fixed

. xtreg roa pos ibk abk atm onbk fs inf intt, re

Random-effects GLS regression                   Number of obs     =        81
Group variable: c_id                            Number of groups  =         8

R-sq:                                           Obs per group:
     within = 0.1102                                         min =         8
     between = 0.0996                                        avg =      10.1
     overall = 0.1051                                        max =        11

                                                Wald chi2(8)      =      8.45
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.3904

------------------------------------------------------------------------------
         roa |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |  -.1290568   .1471895    -0.88   0.381     -.417543    .1594293
         ibk |   .6948579   .5611335     1.24   0.216    -.4049434    1.794659
         abk |   .1480192   .1451855     1.02   0.308    -.1365392    .4325776
         atm |  -.4422047   .3771026    -1.17   0.241    -1.181312    .2969029
        onbk |   .3310553    .632098     0.52   0.600    -.9078341    1.569945
          fs |   .0508608   .1070778     0.47   0.635    -.1590079    .2607295
         inf |  -.0662981   .0609839    -1.09   0.277    -.1858243    .0532281
        intt |   .3097025   .1684647     1.84   0.066    -.0204822    .6398873
       _cons |  -9.056595   3.922307    -2.31   0.021    -16.74418   -1.369014
-------------+----------------------------------------------------------------
     sigma_u |         0
     sigma_e |   1.10864
         rho |         0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

. hausman fixed ., sigmamore

	---- Coefficients ----			
	(b) fixed	(B) .	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
pos	.0678309	-.1290568	.1968877	.1185088
ibk	.6315266	.6948579	-.0633314	.3162315
abk	-.1384383	.1480192	-.2864575	.096588
atm	-.8835295	-.4422047	-.4413248	.2476918
onbk	1.149012	.3310553	.8179571	.4405537
fs	-.1747033	.0508608	-.2255641	.2307079
inf	-.0405211	-.0662981	.025777	.0098729
intt	.1833257	.3097025	-.1263769	.0495721

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 31.07
Prob>chi2 = 0.0001
(V_b-V_B is not positive definite)

```
. xtreg roe pos ibk abk atm onbk fs inf intt, fe

Fixed-effects (within) regression               Number of obs      =        81
Group variable: c_id                            Number of groups   =         8

R-sq:                                           Obs per group:
     within = 0.2375                                         min =         8
     between = 0.2192                                        avg =      10.1
     overall = 0.2111                                        max =        11

                                                F(8,65)           =      2.53
corr(u_i, Xb)  = -0.2387                        Prob > F          =    0.0184

------------------------------------------------------------------------------
         roe |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |   .1049803   .1429691     0.73   0.465    -.1805487    .3905094
         ibk |   .8733267   .4873158     1.79   0.078    -.0999101    1.846563
         abk |  -.0434054   .1319312    -0.33   0.743    -.3068901    .2200793
         atm |  -.7878208   .3413473    -2.31   0.024    -1.469538   -.1061031
        onbk |   .8960621   .5829251     1.54   0.129    -.2681196    2.060244
          fs |  -.0319176   .1924321    -0.17   0.869    -.4162309    .3523958
         inf |  -.0794118   .0467397    -1.70   0.094    -.1727574    .0139338
        intt |   .2321229    .13286     1.75   0.085    -.0332168    .4974627
       _cons |  -5.287145   5.239027    -1.01   0.317     -15.7502    5.175914
-------------+----------------------------------------------------------------
     sigma_u |  .59237996
     sigma_e |  1.0569592
         rho |  .23902975   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(7, 65) = 2.45                     Prob > F = 0.0272


. estimates store fixed
```

```
. xtreg roe pos ibk abk atm onbk fs inf intt, re

Random-effects GLS regression                   Number of obs     =        81
Group variable: c_id                            Number of groups  =         8

R-sq:                                           Obs per group:
     within = 0.1946                                         min =         8
     between = 0.4707                                        avg =      10.1
     overall = 0.2510                                        max =        11

                                                Wald chi2(8)      =     24.13
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0022

------------------------------------------------------------------------------
         roe |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |   .0235843   .1189403     0.20   0.843    -.2095345     .256703
         ibk |   1.183509   .4534385     2.61   0.009     .2947857    2.072232
         abk |   .1518576    .117321     1.29   0.196    -.0780872    .3818025
         atm |  -.6732025   .3047276    -2.21   0.027    -1.270458   -.0759473
        onbk |   .1535722   .5107833     0.30   0.764    -.8475446    1.154689
          fs |  -.0083755    .086527    -0.10   0.923    -.1779654    .1612143
         inf |  -.0892412   .0492796    -1.81   0.070    -.1858275    .0073451
        intt |   .2632057   .1361323     1.93   0.053    -.0036087    .5300201
       _cons |  -6.159831   3.169523    -1.94   0.052    -12.37198    .0523195
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  1.0569592
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

. hausman fixed ., sigmamore

	---- Coefficients ----			
	(b) fixed	(B) .	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
pos	.1049803	.0235843	.0813961	.0957641
ibk	.8733267	1.183509	-.3101822	.2555391
abk	-.0434054	.1518576	-.195263	.0780505
atm	-.7878208	-.6732025	-.1146183	.2001538
onbk	.8960621	.1535722	.7424899	.3560009
fs	-.0319176	-.0083755	-.0235421	.1864295
inf	-.0794118	-.0892412	.0098294	.007978
intt	.2321229	.2632057	-.0310827	.040058

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 15.02
Prob>chi2 = 0.0357
(V_b-V_B is not positive definite)

Objective II

```
. xtset c_id years
      panel variable: c_id (strongly balanced)
       time variable: years, 2010 to 2020
             delta: 1 unit

. xtreg td pos ibk abk atm onbk fs inf intt, fe

Fixed-effects (within) regression               Number of obs      =        81
Group variable: c_id                            Number of groups   =         8

R-sq:                                           Obs per group:
     within = 0.7289                                         min =         8
     between = 0.2618                                        avg =      10.1
     overall = 0.1911                                        max =        11

                                                F(8,65)           =     21.84
corr(u_i, Xb)  = 0.1902                         Prob > F          =    0.0000

------------------------------------------------------------------------------
          td |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |   .1613512   .0405777     3.98   0.000     .0803119    .2423905
         ibk |   .1783849   .1383107     1.29   0.202    -.0978407    .4546105
         abk |  -.1206747   .0374449    -3.22   0.002    -.1954574   -.0458921
         atm |   .0090469   .0968817     0.09   0.926    -.1844393    .2025331
        onbk |  -.3568441   .1654467    -2.16   0.035    -.687264    -.0264242
          fs |   .4306956   .0546164     7.89   0.000     .3216192     .539772
         inf |  -.0072517   .0132657    -0.55   0.586    -.0337452    .0192418
        intt |  -.1083486   .0377085    -2.87   0.005    -.1836577   -.0330394
       _cons |   9.807922   1.486949     6.60   0.000     6.83828     12.77756
-------------+----------------------------------------------------------------
     sigma_u |  3.0947935
     sigma_e |  .29998784
         rho |  .99069144   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(7, 65) = 677.97                     Prob > F = 0.0000

.

. estimates store fixed

.
. xtreg td pos ibk abk atm onbk fs inf intt, re
```

```
Random-effects GLS regression                   Number of obs     =        81
Group variable: c_id                            Number of groups  =         8

R-sq:                                           Obs per group:
     within = 0.1161                                         min =         8
     between = 0.6823                                        avg =      10.1
     overall = 0.4248                                        max =        11

                                                Wald chi2(8)      =     53.18
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000

------------------------------------------------------------------------------
          td |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |  -.3848032   .2583548    -1.49   0.136    -.8911692    .1215628
         ibk | -.3721277    .9849309    -0.38   0.706    -2.302557    1.558301
         abk |  -.8650849   .2548372    -3.39   0.001    -1.364557   -.3656131
         atm |   .7033576   .6619103     1.06   0.288    -.5939627    2.000678
        onbk |   2.722486   1.109492     2.45   0.014     .5479229     4.89705
          fs |  .7689103    .1879486     4.09   0.000     .4005377    1.137283
         inf | -.0079068    .1070421    -0.07   0.941    -.2177055    .2018918
        intt |  .0496863    .2956981     0.17   0.867    -.5298713     .629244
       _cons |  -.5511781    6.88464    -0.08   0.936    -14.04482     12.94247
-------------+----------------------------------------------------------------
     sigma_u |         0
     sigma_e | .29998784
         rho |         0  (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

dir : seeout

. hausman fixed ., sigmamore

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fixed	.	Difference	S.E.
pos	.1613512	-.3848032	.5461544	.2080129
ibk	.1783849	-.3721277	.5505125	.5550661
abk	-.1206747	-.8650849	.7444101	.1695364
atm	.0090469	.7033576	-.6943108	.4347617
onbk	-.3568441	2.722486	-3.079331	.7732829
fs	.4306956	.7689103	-.3382147	.4049506
inf	-.0072517	-.0079068	.0006551	.0173294
intt	-.1083486	.0496863	-.1580349	.0870116

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 71.03
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

```
. xtreg dps pos ibk abk atm onbk fs inf intt, fe

Fixed-effects (within) regression               Number of obs      =        81
Group variable: c_id                            Number of groups   =         8

R-sq:                                           Obs per group:
     within = 0.3496                                         min =         8
     between = 0.0450                                        avg =      10.1
     overall = 0.0075                                        max =        11

                                                F(8,65)           =      4.37
corr(u_i, Xb)  = -0.4984                        Prob > F          =    0.0003

------------------------------------------------------------------------------
         dps |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |   .0070343   .0436152     0.16   0.872    -.0800713     .0941399
         ibk |   .1632662   .1486642     1.10   0.276    -.1336367      .460169
         abk |  -.0736855   .0402479    -1.83   0.072    -.1540661     .0066951
         atm |  -.0329896   .1041339    -0.32   0.752    -.2409595     .1749802
        onbk |   .0492226   .1778314     0.28   0.783    -.3059313     .4043765
          fs |   .1927882   .0587047     3.28   0.002     .0755467     .3100296
         inf |   .0196114   .0142588     1.38   0.174    -.0088653     .0480881
        intt |  -.0421455   .0405313    -1.04   0.302     -.123092      .038801
       _cons |   1.240588   1.598256     0.78   0.440     -1.95135     4.432527
-------------+----------------------------------------------------------------
     sigma_u | .69829091
     sigma_e |  .3224438
         rho |  .82425036   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(7, 65) = 25.71                     Prob > F = 0.0000


. estimates store fixed
```

```
. xtreg dps pos ibk abk atm onbk fs inf intt, re

Random-effects GLS regression                   Number of obs     =        81
Group variable: c_id                            Number of groups  =         8

R-sq:                                           Obs per group:
     within = 0.0258                                         min =         8
     between = 0.6332                                        avg =      10.1
     overall = 0.1736                                        max =        11

                                                Wald chi2(8)      =     15.12
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0569

------------------------------------------------------------------------------
         dps |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |  -.1374872   .0626659    -2.19   0.028    -.2603102   -.0146643
         ibk |   .0655804   .2389025     0.27   0.784    -.4026599    .5338207
         abk |   .1318126   .0618127     2.13   0.033     .0106619    .2529633
         atm |  -.0802225   .1605514    -0.50   0.617    -.3948975    .2344525
        onbk |  -.0696628   .2691157    -0.26   0.796    -.5971198    .4577942
          fs |   .0378902   .0455884     0.83   0.406    -.0514613    .1272418
         inf |   .0335385   .0259639     1.29   0.196    -.0173498    .0844267
        intt |  -.0923216   .0717238    -1.29   0.198    -.2328977    .0482546
       _cons |    5.51958   1.669922     3.31   0.001     2.246593    8.792567
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .3224438
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

.
. hausman fixed ., sigmamore

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fixed	.	Difference	S.E.
pos	.0070343	-.1374872	.1445215	.0504551
ibk	.1632662	.0655804	.0976857	.1346355
abk	-.0736855	.1318126	-.2054981	.0411223
atm	-.0329896	-.0802225	.0472329	.1054548
onbk	.0492226	-.0696628	.1188854	.1875657
fs	.1927882	.0378902	.1548979	.0982239
inf	.0196114	.0335385	-.0139271	.0042034
intt	-.0421455	-.0923216	.0501761	.0211053

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 52.90
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

Objective III

```
. xtreg mbb pos ibk abk atm onbk fs inf intt, fe

Fixed-effects (within) regression               Number of obs      =        81
Group variable: c_id                            Number of groups   =         8

R-sq:                                           Obs per group:
     within = 0.7736                                         min =         8
     between = 0.0027                                        avg =      10.1
     overall = 0.0198                                        max =        11

                                                F(8,65)           =     27.76
corr(u_i, Xb)  = -0.2515                        Prob > F          =    0.0000

------------------------------------------------------------------------------
         mbb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |    .070591   .0329679     2.14   0.036     .0047495    .1364325
         ibk |  -.0745636   .1123725    -0.66   0.509    -.2989869    .1498597
         abk |   .0872485   .0304226     2.87   0.006     .0264903    .1480067
         atm |   .1462763   .0787129     1.86   0.068    -.0109243    .3034768
        onbk |  -.1161982   .1344195    -0.86   0.391    -.3846524    .1522561
          fs |   .2761242   .0443738     6.22   0.000     .1875036    .3647449
         inf |  -.0024722   .0107779    -0.23   0.819    -.0239972    .0190528
        intt |  -.0284477   .0306368    -0.93   0.357    -.0896336    .0327383
       _cons |  -2.162401   1.208092    -1.79   0.078    -4.575128    .2503251
-------------+----------------------------------------------------------------
     sigma_u |  1.5545708
     sigma_e |  .24372926
         rho |  .97600901   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(7, 65) = 299.48                     Prob > F = 0.0000
```

```
. estimates store fixed
.
. xtreg mbb pos ibk abk atm onbk fs inf intt, re

Random-effects GLS regression                   Number of obs     =        81
Group variable: c_id                            Number of groups  =         8

R-sq:                                           Obs per group:
     within = 0.0305                                         min =         8
     between = 0.5807                                        avg =      10.1
     overall = 0.2461                                        max =        11

                                                Wald chi2(8)      =     23.50
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0028

------------------------------------------------------------------------------
         mbb |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |  -.3420894   .1406938    -2.43   0.015    -.6178441   -.0663347
         ibk | -.9901942    .5363696    -1.85   0.065    -2.041459     .061071
         abk |   .3791425   .1387782     2.73   0.006     .1071422    .6511428
         atm |  -.0380059   .3604604    -0.11   0.916    -.7444953    .6684836
        onbk |   .3436669   .6042024     0.57   0.569     -.840548    1.527882
          fs |  .2253399    .1023523     2.20   0.028     .0247331    .4259467
         inf |  .0526644    .0582925     0.90   0.366    -.0615869    .1669157
        intt |  -.127313    .1610301    -0.79   0.429    -.4429261    .1883001
       _cons |   .5693301   3.749209     0.15   0.879    -6.778984    7.917645
-------------+----------------------------------------------------------------
     sigma_u |         0
     sigma_e | .24372926
         rho |         0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

. hausman fixed ., sigmamore

	---- Coefficients ----			
	(b) fixed	(B) .	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
pos	.070591	-.3420894	.4126804	.1132788
ibk	-.0745636	-.9901942	.9156305	.3022756
abk	.0872485	.3791425	-.291894	.0923254
atm	.1462763	-.0380059	.1842822	.2367607
onbk	-.1161982	.3436669	-.4598651	.4211112
fs	.2761242	.2253399	.0507843	.2205263
inf	-.0024722	.0526644	-.0551366	.0094372
intt	-.0284477	-.127313	.0988653	.0473844

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 69.83
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)

.

Objective IV

. xtreg bps pos ibk abk atm onbk fs inf intt, fe

```
Fixed-effects (within) regression               Number of obs      =        81
Group variable: c_id                            Number of groups   =         8

R-sq:                                           Obs per group:
     within = 0.3967                                         min =         8
     between = 0.0171                                        avg =      10.1
     overall = 0.0591                                        max =        11

                                                F(8,65)           =      5.34
corr(u_i, Xb)  = -0.2558                        Prob > F          =    0.0000

------------------------------------------------------------------------------
         bps |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |   .0580394   .0272678     2.13   0.037      .0035818    .112497
         ibk |   .2186503   .0929434     2.35   0.022      .0330296    .404271
         abk |  -.1158026   .0251626    -4.60   0.000     -.1660558   -.0655494
         atm |    .047541   .0651035     0.73   0.468     -.0824797    .1775617
        onbk |  -.3123674   .1111785    -2.81   0.007     -.5344061   -.0903286
          fs |   .1215734   .0367016     3.31   0.002      .0482752    .1948716
         inf |  -.0030009   .0089144    -0.34   0.737     -.0208043    .0148024
        intt |   -.025043   .0253397    -0.99   0.327      -.07565    .0255639
       _cons |   2.704035   .9992142     2.71   0.009      .7084664    4.699604
-------------+----------------------------------------------------------------
     sigma_u |  .61577345
     sigma_e |  .20158871
         rho |  .90320019   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(7, 65) = 59.45                     Prob > F = 0.0000
```

```
.
. estimates store fixed
.
. xtreg bps pos ibk abk atm onbk fs inf intt, re

Random-effects GLS regression                   Number of obs     =        81
Group variable: c_id                            Number of groups  =         8

R-sq:                                           Obs per group:
     within = 0.0021                                         min =         8
     between = 0.5933                                        avg =      10.1
     overall = 0.3090                                        max =        11

                                                Wald chi2(8)      =     32.20
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0001

------------------------------------------------------------------------------
         bps |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pos |  -.0941562   .0549042    -1.71   0.086    -.2017666    .0134541
         ibk |   .0551588   .2093125     0.26   0.792    -.3550862    .4654038
         abk |   .0009961   .0541567     0.02   0.985    -.1051491    .1071414
         atm |   .0498608   .1406658     0.35   0.723    -.2258392    .3255607
        onbk |  -.4713756   .2357835    -2.00   0.046    -.9335028   -.0092483
          fs |   .0477732   .0399419     1.20   0.232    -.0305115    .1260579
         inf |    .019038    .022748     0.84   0.403    -.0255474    .0636233
        intt |   -.067873   .0628403    -1.08   0.280    -.1910377    .0552916
       _cons |   5.056322   1.463089     3.46   0.001     2.18872    7.923923
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .20158871
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

.
. hausman fixed ., sigmamore

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fixed	.	Difference	S.E.
pos	.0580394	-.0941562	.1521956	.0442058
ibk	.2186503	.0551588	.1634915	.1179598
abk	-.1158026	.0009961	-.1167987	.036029
atm	.047541	.0498608	-.0023198	.0923934
onbk	-.3123674	-.4713756	.1590082	.1643342
fs	.1215734	.0477732	.0738002	.0860581
inf	-.0030009	.019038	-.0220389	.0036827
intt	-.025043	-.067873	.04283	.0184913

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 62.27
Prob>chi2 = 0.0000
(V_b-V_B is not positive definite)