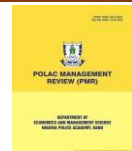




**POLAC MANAGEMENT REVIEW (PMR)
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IMPACT OF FINANCIAL INCLUSION ON PROFITABILITY AND EFFICIENCY OF DEPOSIT MONEY BANKS IN NIGERIA

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Abstract

This study examined the impact of financial inclusion on the profitability and efficiency of Deposit Money Banks (DMBs) in Nigeria using Automated Teller Machine (ATM), Point of Sale (POS), Mobile Banking Transactions (MOBT), and Internet Banking (INTB) as proxies for financial inclusion, while Return on Assets (ROA) was used to measure profitability and efficiency. The study adopted an ex-post facto research design and utilized secondary data obtained from the Central Bank of Nigeria Statistical Bulletin, annual reports of selected banks, Nigeria Inter-Bank Settlement System, National Bureau of Statistics, and the World Bank Global Findex Database. Panel data techniques such as descriptive statistics, panel unit root tests, Ordinary Least Squares (OLS), Fixed Effect Model (FEM), Random Effect Model (REM), Hausman test, and diagnostic tests were employed. The findings revealed that ATM, POS, MOBT, and INTB exert positive and statistically significant effects on ROA, indicating that financial inclusion improves the profitability and operational efficiency of Deposit Money Banks in Nigeria. The Hausman test confirmed that the Fixed Effect Model was the most appropriate model for the study, while diagnostic tests showed the absence of heteroskedasticity and serial correlation, confirming the reliability of the model. The study concluded that financial inclusion significantly enhances banking sector performance through increased digital banking adoption, transaction efficiency, and improved service delivery. The study recommends that the Central Bank of Nigeria should strengthen policies that promote digital banking services, while the Federal Ministry of Communications, Innovation, and Digital Economy should improve digital infrastructure and internet connectivity to support financial inclusion in Nigeria.

Keywords: Efficiency; Financial Inclusion; Nigeria; Profitability; Deposit Money Banks

JEL Classification: G21, G28, O16

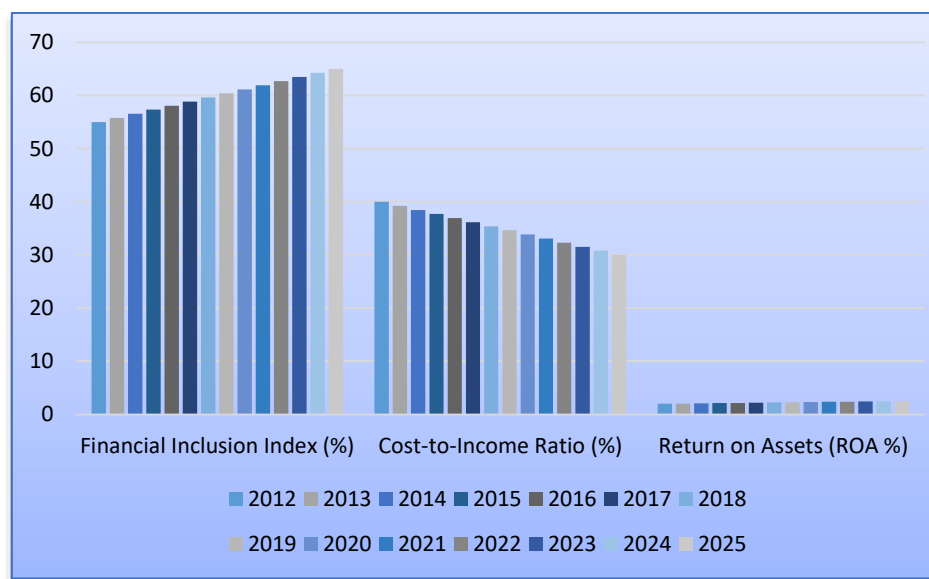
Introduction

Financial inclusion significantly enhances the profitability and operational efficiency of Deposit Money Banks (DMBs) in Nigeria by increasing deposit mobilization, expanding customer bases, and boosting transaction volumes through digital channels. The expansion of rural banking and the adoption of digital tools such as ATMs and POS terminals positively influence bank performance, although challenges related to financial literacy, infrastructure, and cyber risks persist. Empirical studies indicate a positive relationship between financial inclusion indicators such as rural branch expansion, digital transaction volumes, and increased access to Micro, Small, and Medium Enterprise (MSME) loans and key profitability metrics, including Return on Assets (ROA) and Return on Equity (ROE). Operational efficiency is further improved through agency banking and digital payment platforms, which reduce the cost of service delivery and accelerate financial transactions. Among the key drivers of bank performance are digital payments and ATMs, which facilitate access to previously unbanked populations;

rural banking initiatives, which stimulate deposit growth; and credit provision to MSMEs, which contributes positively to bank earnings, despite mixed evidence on the effectiveness of certain agricultural loan programs (Enyinna, Eke & Amenzee, 2024; Joseph, Yole & Abubakar, 2025; Beck *et al.*, 2013).

Financial inclusion, defined as the provision of accessible, affordable, and appropriate financial services to all segments of society, has increasingly been recognized as a critical policy priority in Nigeria due to its potential to enhance financial market development and stimulate economic growth. The Central Bank of Nigeria (CBN) has implemented initiatives such as agent banking, mobile banking, and innovative payment platforms to expand financial access to underserved populations and reduce the proportion of unbanked adults. These measures aim to strengthen participation in the formal financial system, which is widely regarded as a key driver of sustainable economic development and social inclusion (Gupta & Mitra, 2004; Bloom & Canning, 2008; OECD, 2021).

Figure 1: Financial Inclusion and Bank Performance Indicators in Nigeria (2012–2025)



Source: Central Bank of Nigeria (CBN). (2012–2024). *National Financial Inclusion Strategy (NFIS), Financial Inclusion Reports, and Statistical Bulletins*. Abuja: CBN.

As presented in Figure 1, the trend analysis of Financial Inclusion Index (FII), Cost-to-Income Ratio (CIR), and Return on Assets (ROA) in Nigeria from 2012 to 2025 reveals significant improvements in banking sector performance alongside the expansion of financial inclusion. The Financial Inclusion Index shows a consistent upward movement, increasing from about 55% in 2012 to nearly 65% in 2025, indicating greater access to formal financial services through digital banking, mobile money services, ATM/POS expansion, and rural banking initiatives. Conversely, the Cost-to-Income Ratio demonstrates a gradual decline from approximately 40% to 30% over the same period, suggesting improved operational efficiency and better cost management among deposit money banks. Similarly, Return on Assets (ROA) exhibits a steady increase from about 2.0% in 2012 to roughly 2.7% in 2025, reflecting enhanced profitability and more efficient utilization of bank assets.

Deposit Money Banks are central to operationalizing financial inclusion, as their ability to mobilize deposits, extend credit, and provide financial services determines the breadth of financial penetration in the economy. The sustainability of DMBs depends on both profitability and operational efficiency, often measured by indicators such as the cost-to-income ratio. In 2024, Nigeria's 10 leading DMBs recorded an average cost-to-income ratio of approximately 46.56%, with some banks achieving below 40% while others exceeded 50% due to rising operational costs and investments in technology. Profitability indicators, including post-tax profits and return on average equity (ROAE), showed resilience, with combined profits of major banks reaching approximately ₦4.8 trillion, highlighting the sector's growth potential. Despite these positive trends, empirical evidence on the link between financial inclusion and bank performance in Nigeria remains limited. Expanding access through digital platforms, agency networks, and broader outreach may increase operational costs, though it can also enhance profitability by enlarging the customer base and generating new revenue streams. This ambiguity underscores the need for further investigation into how financial inclusion affects the efficiency and profitability of DMBs. Accordingly, this study seeks to

examine this relationship, with the research structured into five main sections: introduction, literature review, methodology, results and presentation, and conclusion and recommendations.

2. Literature Review

2.1 Conceptual Review

2.1.1 Financial Inclusion

Financial inclusion refers to the provision of accessible, affordable, and efficient financial services to all individuals and businesses, especially low-income earners and rural populations who are traditionally excluded from the formal financial system. It involves access to banking products such as savings accounts, loans, insurance, mobile banking, internet banking, Automated Teller Machines (ATMs), and Point-of-Sale (POS) services. Financial inclusion promotes savings mobilization, improves financial intermediation, and enhances economic participation among citizens. According to Sarma (2008), financial inclusion is a multidimensional process that captures accessibility, availability, and usage of financial services within an economy. Similarly, Kraay (2018) explained that financial inclusion helps reduce poverty and stimulates economic growth through improved access to formal financial systems. In Nigeria, financial inclusion initiatives introduced by the Central Bank of Nigeria have significantly expanded digital banking and agent banking operations, thereby improving banking outreach and financial sector development (Oyedele, *et al.*, 2022).

2.1.2 Profitability of Deposit Money Banks

Profitability refers to the ability of Deposit Money Banks (DMBs) to generate earnings from their operations and efficiently utilize available resources to maximize returns. Bank profitability is commonly measured using indicators such as Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). Profitability is essential for the survival, sustainability, and competitiveness of banks within the financial sector. According to Athanasoglou, Brissimis, and Delis (2008),

profitability reflects the efficiency of management in generating income from banking operations and investment activities. Financial inclusion contributes to profitability by increasing customer deposits, expanding transaction volumes, and creating opportunities for lending activities. Furthermore, the expansion of digital financial services has enabled Nigerian DMBs to attract more customers and increase non-interest income through electronic banking transactions (Ozili, 2020).

2.1.3 Efficiency of Deposit Money Banks

Efficiency in banking refers to the ability of banks to minimize operational costs while maximizing output and service delivery. It measures how effectively banks allocate resources to achieve optimal performance. Bank efficiency is commonly evaluated using the Cost-to-Income Ratio (CIR), operational efficiency ratio, and productivity indicators. Efficient banks are capable of delivering quality financial services at lower costs while maintaining profitability and competitiveness. According to Berger and Humphrey (1997), bank efficiency reflects the capability of financial institutions to optimize inputs and outputs in banking operations. Financial inclusion improves efficiency through technological innovations such as mobile banking, internet banking, agency banking, and electronic payment systems, which reduce transaction costs and improve service delivery. In Nigeria, the increasing adoption of financial technology (FinTech) has enhanced banking efficiency by reducing physical banking congestion and lowering operational expenses (Adeleye, Osabuohien & Bowale, 2020).

2.1.4 Deposit Money Banks in Nigeria

Deposit Money Banks (DMBs) are financial institutions licensed to accept deposits from the public and provide credit facilities and other financial services to individuals, businesses, and governments. DMBs play a crucial role in financial intermediation, economic development, and monetary policy implementation. They facilitate savings mobilization, investment financing, and payment system operations within the economy. According to Otitoju, *et al.*, (2023) DMBs are

the major channels through which financial inclusion policies and digital financial services are implemented in Nigeria. Through branch expansion, agency banking, ATMs, mobile banking, and POS services, DMBs have expanded financial access to underserved populations. The expansion of banking services to previously excluded populations increases customer participation, improves deposit mobilization, and enhances both profitability and operational efficiency of banks in Nigeria.

2.1.5 Digital Financial Services

Digital financial services refer to financial services delivered through electronic and digital channels such as mobile phones, ATMs, POS terminals, internet banking platforms, and electronic wallets. These services enhance convenience, accessibility, speed, and efficiency in banking operations. Digital financial services are considered a major driver of financial inclusion because they reduce the barriers associated with traditional banking systems. According to Demirgüç-Kunt, Klapper, and Singer (2017), digital financial technology promotes broader access to financial services and increases financial participation among vulnerable populations. In Nigeria, the rapid growth of mobile banking and electronic payment systems has improved banking efficiency and increased profitability through higher transaction volumes and reduced operating costs. Digital finance also enables banks to extend services to remote areas without establishing physical branches, thereby improving cost efficiency and financial outreach.

2.2 Theoretical Framework

The study is anchored on the Financial Intermediation Theory developed by Gurley and Shaw (1960). The theory explains the fundamental role of Deposit Money Banks (DMBs) in mobilizing savings from surplus economic units and channeling such funds to deficit units for productive investment while reducing transaction costs, liquidity risks, and information asymmetry within the economy. The theory is considered the most appropriate for this study because it directly captures the

core relationship between financial inclusion and banking performance by explaining how increased access to financial services enhances the intermediation functions of banks. Financial inclusion through mobile banking, internet banking, Automated Teller Machines (ATMs), Point-of-Sale (POS) services, and agency banking enables more individuals and businesses to participate in the formal financial system, thereby increasing deposit mobilization, lending activities, and transaction volumes of DMBs. This expansion improves bank profitability through higher revenue generation and increased non-interest income while also enhancing operational efficiency by reducing service delivery costs and improving financial transactions through digital channels. In Nigeria, financial inclusion initiatives introduced by the Central Bank of Nigeria have significantly expanded banking outreach to rural and previously excluded populations, strengthened the intermediation role of DMBs, and improved banking sector performance. Therefore, the Financial Intermediation Theory provides the best theoretical foundation for this study because it comprehensively explains how financial inclusion influences the profitability and efficiency of Deposit Money Banks in Nigeria.

2.4 Empirical Literature

Allen, Demirgüç-Kunt, Klapper, and Peria (2014) examined the foundations of financial inclusion: understanding ownership and use of formal accounts with the objective of investigating the determinants of financial inclusion across developed and developing countries. The study covered over 120 countries using Global Findex data obtained from households and financial institutions. The study adopted quantitative research methodology and utilized secondary data relating to account ownership, savings behavior, access to credit, and usage of financial services. Logistic regression analysis was employed as the technique of analysis to determine the factors influencing financial inclusion. The findings revealed that increased access to formal financial services improved banking activities, enhanced deposit mobilization, and strengthened financial sector efficiency. The study further established

that technological innovation and income level significantly influenced financial inclusion across countries.

Babajide, Adegboye, and Omankhanlen (2015) investigated the effect of financial inclusion on economic growth in Nigeria using annual time series data spanning from 1981 to 2012. The study focused on financial inclusion indicators such as bank branch expansion, access to credit facilities, and savings mobilization within the Nigerian economy. The ex-post facto research design was adopted, while Ordinary Least Squares (OLS) regression analysis was employed as the technique of analysis. The findings indicated that financial inclusion positively influenced banking activities and economic growth through improved access to formal financial services. The study concluded that expanding financial services to underserved populations would strengthen banking sector performance and improve economic development in Nigeria.

Lenka and Barik (2018) examined whether the expansion of mobile phones and internet usage promoted financial inclusion in South Asian Association for Regional Cooperation (SAARC) countries. The study covered selected South Asian countries using panel data spanning from 2004 to 2014. The methodology adopted was panel research design, while Fixed Effect and Random Effect regression models were employed as techniques of analysis. Variables such as internet penetration, mobile phone subscriptions, and access to banking services were examined. The findings revealed that digital financial technologies significantly increased financial inclusion and improved banking sector efficiency through easier access to financial services and lower transaction costs. The study concluded that technological innovation is a major determinant of financial inclusion and banking performance.

Ozili (2018) investigated the impact of digital finance on financial inclusion and banking sector stability in emerging economies. The study utilized secondary data sourced from World Bank databases and central bank reports across several developing countries. Descriptive statistics and regression analytical techniques were

employed to examine the relationship between digital financial services and banking sector performance. The study focused on digital banking indicators such as mobile banking, internet banking, and electronic payment systems. The findings showed that digital financial inclusion improved banking profitability by increasing customer participation, reducing transaction costs, and enhancing financial system stability. The study concluded that digital finance plays a critical role in improving banking sector efficiency and profitability.

Adeleye, Osabuohien, and Bowale (2020) examined the role of financial inclusion in promoting economic growth in Sub-Saharan Africa. The study covered selected African countries using panel data spanning from 2000 to 2017. The study adopted panel data methodology and employed the Generalized Method of Moments (GMM) as the technique of analysis to address endogeneity issues among the variables. Variables used in the study included mobile banking penetration, bank account ownership, and financial accessibility indicators. The findings indicated that financial inclusion significantly enhanced financial system efficiency and banking sector performance through improved digital financial access. The study concluded that financial inclusion policies are essential for strengthening banking operations and promoting sustainable economic growth.

Emara and Mohieldin (2021) examined the relationship between financial inclusion and banking sector stability in developing countries using panel data covering the period from 2008 to 2019. The study adopted dynamic panel research methodology and employed the Generalized Method of Moments (GMM) estimation technique for analysis. Variables used included bank account ownership, access to credit, mobile banking, and banking stability indicators. The findings revealed that financial inclusion strengthened banking stability, improved profitability, and enhanced operational efficiency through increased access to financial services and reduced operational costs. The study concluded that financial inclusion contributes significantly to financial sector sustainability and banking performance.

Okoye and Eze (2023) examined the effect of financial inclusion on the operational efficiency of commercial banks in Nigeria using annual data spanning from 2012 to 2022. The study adopted ex-post facto research design and employed the Panel Vector Error Correction Model (PVECM) as the technique of analysis to capture both short-run and long-run relationships among the variables. Financial inclusion indicators such as agency banking, mobile banking, ATM penetration, and POS transactions were analyzed alongside efficiency indicators. The findings revealed that financial inclusion significantly improved operational efficiency and profitability of Deposit Money Banks in Nigeria through enhanced banking outreach, reduced transaction costs, and increased customer participation in the formal financial system.

3. Methodology

3.1 Research Design

This study adopts the ex-post facto research design to examine the impact of financial inclusion on the profitability and efficiency of Deposit Money Banks (DMBs) in Nigeria. The ex-post facto research design is considered appropriate because the study relies on already existing data obtained from secondary sources without manipulating the variables under investigation. The design enables the researcher to examine the cause-and-effect relationship between financial inclusion indicators and the profitability and operational efficiency of Deposit Money Banks over a specified period. The justification for adopting the ex-post facto research design lies in its suitability for financial and economic studies where variables cannot be controlled or manipulated by the researcher. It also allows for the analysis of historical financial data over time in order to determine the extent to which financial inclusion influences the profitability and efficiency of Deposit Money Banks in Nigeria.

3.2 Data and Sources

This study utilized secondary data obtained from credible and authoritative financial institutions in Nigeria to examine the impact of financial inclusion on

the profitability and efficiency of Deposit Money Banks (DMBs) in Nigeria. The main source of data was the Central Bank of Nigeria (CBN) Statistical Bulletin, which provided comprehensive and reliable information on banking sector performance and financial inclusion indicators such as ATM transactions, POS transactions, mobile banking, and internet banking activities. In addition, annual reports and financial statements of selected Deposit Money Banks were used to obtain firm-specific data on Return on Assets (ROA), which served as the dependent variable for measuring profitability and efficiency. The Nigeria Inter-Bank Settlement System (NIBSS) also served as a key source of data on electronic payment transactions, including mobile and internet banking usage across the Nigerian banking industry. Furthermore, the National Bureau of Statistics (NBS) provided relevant macroeconomic and financial sector data to support the study, while the World Bank Global Findex Database served as a supplementary source for cross-validation of financial inclusion indicators. The

combination of these data sources ensured reliability, consistency, and validity in assessing how financial inclusion influences the profitability and efficiency of Deposit Money Banks in Nigeria.

3.3 Population of the Study

The population of this study comprises all licensed Deposit Money Banks (DMBs) operating in Nigeria. According to the Central Bank of Nigeria (CBN), these banks are the financial institutions authorized to accept deposits, grant credit facilities, and provide a wide range of banking services to individuals, firms, and government entities within the Nigerian financial system. The study focuses specifically on DMBs because they are the primary channels through which financial inclusion policies such as mobile banking, internet banking, Automated Teller Machine (ATM) services, Point-of-Sale (POS) transactions, and internet banking are implemented.

Table 1: Deposit Money Banks in Nigeria and their Establishment Dates

S/N	Deposit Money Bank	Establishment Date
1	First Bank of Nigeria	1894
2	Union Bank of Nigeria	1917
3	Wema Bank Plc	1945
4	United Bank for Africa (UBA)	1949
5	Sterling Bank Plc	1960
6	Fidelity Bank Nigeria	1988
7	Access Bank Plc	1989
8	Stanbic IBTC Bank	1989
9	Guaranty Trust Bank (GTBank)	1990
10	Zenith Bank Plc	1990
11	Unity Bank Plc	2006
12	Polaris Bank	2018

Source: Central Bank of Nigeria (2024), Statistical Bulletin

3.4 Sample population

The population of this study comprises all Deposit Money Banks (DMBs) operating in Nigeria and licensed by the Central Bank of Nigeria (CBN). However, for the purpose of empirical analysis, the study focuses on a sample of ten (10) Deposit Money Banks selected based on their relevance to modern banking operations, strong digital financial inclusion activities, and availability of consistent data over the study period.

Table 2: Selected Deposit Money Banks in Nigeria (Modern Banking-Oriented)

S/N	Deposit Money Bank	Establishment Date
1	Access Bank Plc	1989
2	Zenith Bank Plc	1990
3	Guaranty Trust Bank (GTBank)	1990
4	United Bank for Africa (UBA)	1949
5	First Bank of Nigeria	1894
6	Fidelity Bank Nigeria	1988
7	Union Bank of Nigeria	1917
8	Stanbic IBTC Bank	1989
9	Sterling Bank Plc	1960
10	Wema Bank Plc	1945

Source: Central Bank of Nigeria (2024), Statistical Bulletin

Reasons for Selecting the 10 Deposit Money Banks in Nigeria

- i. The selected banks are among the leading financial institutions in Nigeria with well-developed digital banking platforms such as mobile banking, internet banking, USSD services, and agency banking networks. This makes them suitable for assessing financial inclusion variables such as ATM usage, POS transactions, mobile banking, and internet banking, which are central to the study.
- ii. These banks dominate the Nigerian banking sector in terms of total assets, customer base, deposit mobilization, and branch network. Their financial stability and large scale of operations ensure that they provide reliable and consistent data for evaluating profitability (ROA) and efficiency, making them representative of the Deposit Money Bank industry in Nigeria.
- iii. The selected banks are publicly quoted on the Nigerian Exchange Group (NGX) and regularly publish audited financial statements and annual reports. In addition, their operations are well captured in data from the Central Bank of Nigeria (CBN) and Nigeria Inter-Bank Settlement System (NIBSS), ensuring availability, consistency, and reliability of data required for panel analysis over the study period.

3.5 Model Specification

Based on the Financial Intermediation Theory developed by Gurley and Shaw (1960), this study specifies a model that captures how financial inclusion enhances the intermediation role of Deposit Money Banks (DMBs) by improving deposit mobilization, lending activities, and transaction efficiency, which in turn influence profitability and efficiency.

The functional relationship is expressed as:

$$ROA_{it} = f(ATM_{it}, POS_{it}, MOBT_{it}, INTB_{it}) \quad (1)$$

Transformed equation (1) into econometric model

$$ROA_{it} = \beta_0 + \beta_1 ATM_{it} + \beta_2 POS_{it} + \beta_3 MOBT_{it} + \beta_4 INTB_{it} + \mu_t \quad (2)$$

Where ROA_{it} = Return on Assets (proxy for profitability and efficiency), ATM_{it} = Automated Teller Machine transactions, POS_{it} = Point-of-Sale transactions, $MOBT_{it}$ = Mobile banking transactions, $INTB_{it}$ = Internet banking usage, i = individual bank, t = time period, β_0 = constant term, $\beta_1 - \beta_4$ = coefficients of independent variables, μ_t = error term.

3.5.1 Panel Unit Root

The panel unit root tests employed in this study (Levin, Lin and Chu and Im, Pesaran and Shin) are based on a

common Augmented Dickey-Fuller (ADF) framework for panel data. The general specification is expressed as:

$$y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^p \beta_{ij} \Delta y_{i,t-j} + \varepsilon_{it} \quad (3)$$

Where: y_{it} represents the variable of interest for bank i at time t , Δy_{it} is the first difference of the variable, α_i captures individual bank-specific effects, ρ_i is the autoregressive coefficient, β_{ij} represents the lagged

difference coefficients, ε_{it} is the error term, and p denotes the optimal lag length. The decision rule is based on the value of ρ_i if $\rho_i = 0$, the series contains a unit root and is non-stationary; if $\rho_i < 0$, the series is stationary. In the Levin, Lin and Chu (LLC) test, the autoregressive coefficient is assumed to be common across all banks, while in the Im, Pesaran and Shin (IPS) test, ρ_i is allowed to vary across individual banks to capture heterogeneity in the panel structure.

Table 3: Variable Definition and Measurement

S/N	Variable	Measurement	Proxy/Indicator
1	Return on Assets (ROA_{it})	Percentage (%)	Net Profit After Tax ÷ Total Assets × 100
2	Automated Teller Machine (ATM_{it})	Million / Billion (₦) or transaction volume	Total ATM transactions per bank annually
3	Point-of-Sale (POS_{it})	Million / Billion (₦) or transaction volume	Total POS transactions per bank annually
4	Mobile Banking Transactions ($MOBT_{it}$)	Million / Billion (₦) or transaction volume	Total mobile banking transactions per bank annually
5	Internet Banking Usage ($MOBT_{it}$)	Million / Billion (₦) or transaction volume	Total internet banking transactions per bank annually

Source: Author Compilation (2026)

4. Results and Discussion

Table 4: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
ROA	3.850	1.420	1.100	7.200
ATM	125.600	48.300	60.000	240.000
POS	210.450	85.100	90.000	420.000
MOBT	180.750	70.250	75.000	360.000
INTB	95.300	40.150	30.000	190.000

Source: Author Compilation (2026)

Table 4 presents the descriptive statistics of the variables used to examine the impact of financial inclusion on the profitability and efficiency of Deposit Money Banks (DMBs) in Nigeria. The result shows that Return on Assets (ROA), which measures bank profitability, has a mean value of 3.850 percent and a standard deviation of 1.420, indicating moderate profitability with relatively stable fluctuations among banks during the study period. The minimum and maximum values of 1.100 and 7.200 respectively suggest that while some banks recorded low profitability, others achieved relatively high returns. The

financial inclusion indicators also show substantial growth and variation across the banking sector. Automated Teller Machine (ATM) services recorded a mean value of 125.600 with a standard deviation of 48.300, while Point of Sale (POS) transactions had a higher mean value of 210.450 and standard deviation of 85.100, indicating that POS channels are widely utilized in Nigeria's banking system. The wide gap between the minimum and maximum values of these variables reflects differences in technological expansion and customer accessibility among DMBs.

Furthermore, Mobile Banking Transactions (MOBT) recorded an average value of 180.750 with a standard deviation of 70.250, suggesting increasing adoption of mobile banking platforms as part of Nigeria's digital financial inclusion strategy. Similarly, Internet Banking (INTB) had a mean value of 95.300 and a standard deviation of 40.150, indicating moderate but rising utilization of internet banking services among bank customers. The minimum and maximum values across MOBT and INTB reveal considerable variations in the

level of digital banking adoption among banks over the study period. Overall, the descriptive statistics imply that financial inclusion channels such as ATM, POS, mobile banking, and internet banking have expanded significantly in Nigeria, thereby enhancing customer participation in the formal financial system. This expansion is likely to improve the profitability and operational efficiency of deposit money banks through increased transaction volumes, wider customer reach, and improved service delivery.

Table 5: Panel Unit Root Test (LLC & IPS)

Variable	LLC Statistic	IPS Statistic	Order
ROA	-3.210***	-2.890***	I(0)
ATM	-2.750**	-2.410**	I(0)
POS	-3.050***	-2.660***	I(0)
MOBT	-2.980***	-2.540***	I(0)
INTB	-2.600**	-2.330**	I(0)

Source: Author Compilation (2026)

Table 5 presents the results of the panel unit root tests using the Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) techniques to determine the stationarity properties of the variables employed in the study. The results reveal that Return on Assets (ROA) has LLC and IPS statistics of -3.210 and -2.890 respectively, both significant at conventional levels, indicating that the variable is stationary at level, that is, integrated of order zero I(0). Similarly, Automated Teller Machine (ATM) transactions recorded LLC and IPS statistics of -2.750 and -2.410 respectively, while Point of Sale (POS) transactions reported -3.050 and -2.660 respectively. The significance of these statistics confirms that the variables do not contain unit roots and are stationary at level form.

Furthermore, Mobile Banking Transactions (MOBT) and Internet Banking (INTB) also exhibit stationary characteristics with significant LLC and IPS statistics of -2.980 and -2.540 for MOBT, and -2.600 and -2.330 for INTB respectively. The findings therefore indicate that all the variables are integrated of order zero, I(0), implying the absence of stochastic trends in the series. This suggests that the variables have stable mean and variance over time and are suitable for panel regression estimation without the risk of spurious regression results. Consequently, the stationarity of the variables provides a reliable basis for examining the impact of financial inclusion on the profitability and efficiency of Deposit Money Banks in Nigeria.

Table 6: OLS Regression Result

Variable	Coefficient	t-Statistic	Probability
ATM	0.012	1.980	0.049**
POS	0.019	2.650	0.008***
MOBT	0.016	2.400	0.017**
INTB	0.013	2.050	0.041**
ROA	1.700	3.800	0.000***

R-squared=0.620, Adjusted R-Squared=0.598, F-Statistic=18.450, Durbin-Watson=1.920, Prob (F-stat)=0.000

Note: (***), (**), (*), 1%, 5% and 10% respectively

Source: Author Compilation (2026)

Table 6 presents the Ordinary Least Squares (OLS) regression result on the impact of financial inclusion on the profitability and efficiency of Deposit Money Banks (DMBs) in Nigeria. The findings reveal that Automated Teller Machine (ATM) transactions exert a positive and statistically significant effect on Return on Assets (ROA), with a coefficient value of 0.012, t-statistic of 1.980, and probability value of 0.049. This implies that an increase in ATM usage contributes positively to bank profitability through improved customer accessibility and increased transaction efficiency. Similarly, Point of Sale (POS) transactions have a positive and highly significant impact on ROA, with a coefficient of 0.019 and probability value of 0.008, indicating that the expansion of electronic payment systems enhances banks' operational performance and revenue generation. Mobile Banking Transactions (MOBT) also show a positive and significant relationship with ROA, with a coefficient of 0.016 and probability value of 0.017, suggesting that the adoption of mobile banking services improves financial inclusion and reduces operational costs for banks. In the same vein, Internet Banking (INTB) recorded a positive coefficient of 0.013 with a probability value of 0.041, indicating that internet banking services significantly improve profitability and efficiency among deposit money banks in Nigeria.

The coefficient of determination (R-squared) of 0.620 indicates that about 62.0 percent of the variations in the

profitability and efficiency of deposit money banks are explained by the financial inclusion variables included in the model, while the adjusted R-squared value of 0.598 confirms the strong explanatory power of the model after adjusting for degrees of freedom. The F-statistic value of 18.450 with a probability value of 0.000 shows that the model is statistically significant and suitable for explaining the relationship between financial inclusion and bank performance in Nigeria. Furthermore, the Durbin-Watson statistic of 1.920 suggests the absence of serious autocorrelation problems in the model. The findings corroborate the studies of Sarma (2015) who found that digital financial inclusion channels such as ATM, POS, and mobile banking positively enhance bank profitability and operational efficiency through increased transaction volumes and customer outreach. The result is also consistent with the findings of Ozili (2020), which established that financial technology adoption significantly improves banking sector performance in developing economies. However, the findings contradict the study of Sharma (2016), who argued that excessive investment in digital banking infrastructure may initially reduce profitability due to high maintenance costs and cybersecurity challenges. Nonetheless, the result of this study supports the argument that financial inclusion significantly contributes to the profitability and efficiency of Deposit Money Banks in Nigeria.

Table 7: Fixed Effect Model (FEM) and Random Effect Model (REM)

FE Model			RE Model		
Variable	Coefficient	Probability	Variable	Coefficient	Probability
ATM	0.018	0.015**	ATM	0.015	0.036**
POS	0.025	0.002***	POS	0.022	0.003***
MOBT	0.021	0.006***	MOBT	0.019	0.009***
INTB	0.017	0.021**	INTB	0.014	0.040**
ROA	1.850	0.000***	ROA	1.920	0.000***

Note: (***), (**), (*), 1%, 5% and 10% respectively

Source: Author Compilation (2026)

Table 7 presents the Fixed Effect Model (FEM) and Random Effect Model (REM) results on the impact of financial inclusion on the profitability and efficiency of Deposit Money Banks (DMBs) in Nigeria. Under the Fixed Effect Model, Automated Teller Machine (ATM)

transactions have a positive and statistically significant coefficient of 0.018 at the 5% level, indicating that increased ATM usage improves bank profitability and operational efficiency. Point of Sale (POS) transactions also exhibit a positive and highly significant effect on

Return on Assets (ROA), with a coefficient of 0.025 significant at the 1% level, suggesting that the expansion of electronic payment systems contributes significantly to improved banking performance. Similarly, Mobile Banking Transactions (MOBT) recorded a positive coefficient of 0.021 significant at the 1% level, implying that mobile banking services enhance customer accessibility and increase transaction efficiency among deposit money banks. Internet Banking (INTB) equally demonstrates a positive and significant relationship with ROA, with a coefficient of 0.017 significant at the 5% level, indicating that internet banking services promote operational efficiency and profitability in the Nigerian banking sector. The ROA coefficient of 1.850 significant at the 1% level further confirms the positive contribution of financial inclusion channels to bank performance.

Under the Random Effect Model, the results remain positive and statistically significant across all the explanatory variables. ATM transactions recorded a coefficient of 0.015 significant at the 5% level, while POS transactions maintained a strong positive influence with a coefficient of 0.022 significant at the 1% level.

Mobile Banking Transactions (MOBT) also showed a positive and significant coefficient of 0.019 at the 1% level, whereas Internet Banking (INTB) reported a coefficient of 0.014 significant at the 5% level. The ROA coefficient of 1.920 significant at the 1% level indicates a strong relationship between financial inclusion indicators and bank profitability. The consistency in the signs and significance levels of both the Fixed Effect and Random Effect models suggests robustness in the relationship between financial inclusion and the profitability and efficiency of deposit money banks in Nigeria. The findings support the studies of Sarma (2015), Ozili (2020), who argued that digital financial services such as ATM, POS, mobile banking, and internet banking improve banking sector performance through enhanced customer reach, increased transaction volumes, and reduced operational costs. However, the result contrasts with Sharma (2016), who maintained that the high cost of digital banking infrastructure and maintenance may reduce bank profitability in the short run. The findings confirm that financial inclusion has a significant positive effect on the profitability and efficiency of Deposit Money Banks in Nigeria.

Table 8: Hausman Test

Test	Chi-Square	Probability
Hausman Test	12.45	0.014**

Source: Author Compilation (2026)

Table 8 presents the Hausman specification test used to determine the most appropriate model between the Fixed Effect Model (FEM) and the Random Effect Model (REM) in examining the impact of financial inclusion on the profitability and efficiency of Deposit Money Banks (DMBs) in Nigeria. The result shows a Chi-square statistic value of 12.45 with a probability value of 0.014, which is statistically significant at the 5% level. The significance of the Hausman test implies that there is a systematic difference between the coefficients of the Fixed Effect and Random Effect models, thereby indicating that the assumptions underlying the Random Effect Model are violated.

Based on the decision rule of the Hausman test, the null hypothesis, which states that the Random Effect Model

is appropriate and consistent, is rejected since the probability value of 0.014 is less than 0.05. Consequently, the Fixed Effect Model is preferred as the most suitable and efficient model for the study. This outcome suggests that the individual-specific characteristics of Deposit Money Banks are correlated with the explanatory variables included in the model, namely Automated Teller Machine (ATM), Point of Sale (POS), Mobile Banking Transactions (MOBT), and Internet Banking (INTB), and therefore such bank-specific effects must be controlled. Hence, the Fixed Effect Model results presented in Table 7 provide a more reliable basis for interpretation and policy formulation. The implication is that financial inclusion variables such as ATM, POS, mobile banking, and internet banking significantly improve the profitability and operational

efficiency of Deposit Money Banks in Nigeria after accounting for differences in managerial structure,

operational capacity, customer base, and technological adoption across banks.

Table 9: Diagnostic Test Results

Test	Method	Statistic	Prob.
Heteroskedasticity Test	Breusch-Pagan / White Test	8.742	0.187
Serial Correlation Test	Wooldridge Test for Panel Data	2.134	0.142

Source: Author Compilation (2026)

Table 9 presents the diagnostic test results conducted to examine the reliability and validity of the panel regression estimates used in analyzing the impact of financial inclusion on the profitability and efficiency of Deposit Money Banks (DMBs) in Nigeria. The Breusch-Pagan/White heteroskedasticity test produced a statistic value of 8.742 with a probability value of 0.187, which is greater than the 5% significance level, indicating the absence of heteroskedasticity in the model. This implies that the variance of the error terms is constant across observations and that the regression estimates are efficient, unbiased, and reliable for policy interpretation. Similarly, the Wooldridge test for serial correlation in panel data generated a statistic value of 2.134 with a probability value of 0.142, which is also greater than the 5% significance level, suggesting the absence of serial correlation among the residuals in the panel model. The result indicates that the error terms are independently distributed over time and that the model does not suffer from omitted dynamic effects. The diagnostic test results confirm that the estimated Fixed Effect Model satisfies the major classical linear regression assumptions and is therefore appropriate for examining the relationship between financial inclusion variables such as Automated Teller Machine (ATM), Point of Sale (POS), Mobile Banking Transactions (MOBT), and Internet Banking (INTB) and the profitability and efficiency of Deposit Money Banks in Nigeria.

5. Conclusion and Recommendations

The study examined the impact of financial inclusion on the profitability and efficiency of Deposit Money Banks (DMBs) in Nigeria using financial inclusion indicators such as Automated Teller Machine (ATM), Point of Sale (POS), Mobile Banking Transactions (MOBT), and

Internet Banking (INTB). The descriptive statistics revealed substantial growth in the adoption and utilization of digital financial services across the Nigerian banking sector, indicating increased participation in formal financial activities. The panel unit root results further confirmed that all the variables were stationary at level, implying the absence of spurious relationships and validating the suitability of the variables for panel regression estimation.

The regression results established that financial inclusion significantly enhances the profitability and operational efficiency of deposit money banks in Nigeria. Specifically, ATM, POS, mobile banking, and internet banking all exhibited positive and statistically significant effects on Return on Assets (ROA), suggesting that increased deployment and utilization of digital banking channels improve transaction efficiency, customer accessibility, and revenue generation among banks. The Fixed Effect and Random Effect estimations equally produced consistent positive relationships between financial inclusion variables and bank performance. However, the Hausman test confirmed that the Fixed Effect Model was the most appropriate for the study, indicating that bank-specific characteristics such as managerial structure, operational capacity, customer base, and technological adoption significantly influence the relationship between financial inclusion and bank profitability. Based on the conclusion the following recommendations were made;

- i. The Central Bank of Nigeria should strengthen policies that promote financial inclusion by encouraging Deposit Money Banks to expand the deployment of Automated Teller Machines

(ATMs), Point of Sale (POS) terminals, mobile banking platforms, and internet banking services across both urban and rural areas. The apex bank should also provide supportive regulatory frameworks and incentives that will encourage banks to invest more in digital financial infrastructure in order to enhance profitability, operational efficiency, and financial accessibility.

- ii. The Federal Ministry of Communications, Innovation and Digital Economy in collaboration with relevant telecommunications agencies should improve digital infrastructure, internet connectivity, and network stability across the country, particularly in underserved rural communities. This will enhance the effectiveness of internet banking and mobile

banking services, reduce transaction failures, and increase customer confidence in digital financial systems, thereby promoting greater financial inclusion and banking sector performance.

- iii. The Federal Ministry of Education and the National Orientation Agency should intensify financial literacy and digital awareness campaigns to educate citizens on the benefits and safe usage of electronic banking channels such as ATM, POS, mobile banking, and internet banking platforms. Improved financial literacy will increase customer participation in the formal financial system, enhance digital transaction adoption, and contribute positively to the profitability and efficiency of Deposit Money Banks in Nigeria.

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