FINANCIAL INCLUSION TECHNOLOGY AND POVERTY REDUCTION IN NIGERIA

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Abstract
This study investigates the impact of financial inclusion technologies—namely ATMs, POS systems, and mobile payments—on poverty alleviation in Nigeria. Using trend analysis and error correction econometric methods, the research evaluates how these technologies contribute to reducing poverty levels across different regions and demographics in the country. The findings reveal that ATMs and mobile payment systems significantly reduce poverty, primarily by enhancing access to financial services, promoting economic participation, and providing financial stability to low-income individuals. In contrast, POS systems do not exhibit a strong reductive effect on poverty, likely due to limited accessibility in rural areas and among the unbanked population. The study also highlights the positive role of financial deepening in poverty reduction, emphasizing the importance of expanding access to a wide range of financial services. The implications suggest that targeted investments in financial infrastructure, regulatory support, and financial literacy initiatives are essential to maximizing the poverty-alleviating potential of these technologies. The research concludes that a comprehensive approach to financial inclusion and deepening, tailored to the needs of underserved populations, is crucial for achieving sustainable poverty reduction and fostering inclusive economic growth in Nigeria.
Keywords: *Financial Inclusion, ATM, POS, Mobile Pay, Poverty alleviation*

Introduction

Poverty remains a significant challenge in Nigeria, where a substantial portion of the population lives below the poverty line (Agba, Agba, Ushie, & Akwara, 2024). The Nigerian economy, characterized by a high unemployment rate, low income, and limited access to financial services, contributes to the persistence of poverty (Ezeudu and Tukur, 2024). In this context, financial inclusion has emerged as a critical strategy for poverty alleviation, aiming to provide affordable and accessible financial services to the underserved and unbanked populations (Ozili, Ademiju, & Rachid, 2023).

Financial inclusion refers to the availability and equality of opportunities to access financial services (Ozili, 2020). It is considered a key driver of economic growth and poverty reduction, as it enables individuals and businesses to participate fully in the economy. In Nigeria, financial inclusion has gained increasing attention from

policymakers, financial institutions, and development agencies as a means to enhance economic opportunities and reduce poverty (Wayne, Soetan, Bajepade, & Mogaji, 2020). Technological advancements have played a significant role in promoting financial inclusion in Nigeria. The introduction and expansion of financial inclusion technologies such as Automated Teller Machines (ATMs), Point of Sale (POS) terminals, and mobile payment platforms have revolutionized the financial landscape (Ozili, 2021). These technologies have significantly improved access to financial services, particularly in rural and underserved areas where traditional banking infrastructure is limited (Ozili, 2021).

ATMs have become widespread, offering convenient access to cash withdrawals, account inquiries, and other banking services (Adedotun *et al.* 2024). POS terminals have facilitated cashless transactions, enabling businesses, especially small and medium enterprises (SMEs), to conduct transactions more efficiently. Mobile payment platforms, including mobile money services, have been particularly impactful, allowing individuals to perform financial transactions using their mobile phones, bypassing the need for a physical bank account (Adedotun *et al.* 2024).

These technologies have the potential to contribute significantly to poverty alleviation by increasing access to financial services, reducing transaction costs, and promoting financial literacy. For instance, mobile payments have enabled many previously unbanked individuals to save, invest, and manage their finances more effectively, thereby enhancing their economic resilience. Furthermore, financial inclusion technologies have supported the growth of microenterprises, providing them with the tools needed to access credit, expand their businesses, and improve their livelihoods.
The period from 2010 to 2022 witnessed significant advancements in financial inclusion technologies in Nigeria. These developments were driven by a combination of government initiatives, technological innovation, and growing demand for financial services, especially among underserved populations. Table 1 below is a tabular display and analysis of the trends of financial inclusion technologies from 2010 to 2022 in Nigeria.

Table 1: Trends of financial inclusion technologies in Nigeria (2010 – 2022)

Year	ATM Value of Transactions (₦'Billion)	POS Value of Transactions (₦'Billion)	Mobile Pay Value of Transactions (₦'Billion)
2010	19675.51	12.72000	25.05000
2011	22302.65	31.02000	59.61000
2012	7461.630	48.01000	31.57000
2013	7674.860	161.0200	47.32000
2014	7269.080	312.0700	74.04000
2015	6195.460	448.5100	91.58000
2016	5829.550	759.0000	132.3600

2017	5381.910	1409.810	184.6000
2018	5035.330	2383.110	675.9200
2019	4481.670	3204.750	478.1400
2020	1152.750	633.8100	107.6400
2021	1118.160	749.8200	116.2600
2022	1099.700	856.8600	120.5700

Source: Central Bank of Nigeria (CBN) Financial Statistical Bulletin, 2022.

The data provided in table 1 on the value of transactions through Automated Teller Machines (ATMs), Point of Sale (POS) terminals, and Mobile Payment platforms in Nigeria from 2010 to 2022 reveals significant trends and shifts in the usage of these financial inclusion technologies. The value of ATM transactions in Nigeria peaked in 2011 at N22,302.65 billion, followed by a steep decline to N7,461.63 billion in 2012. The subsequent years show a fluctuating trend with a general decline, reaching N1,099.70 billion in 2022. The initial high value of ATM transactions in 2010 and 2011 can be attributed to the widespread adoption of ATMs as a convenient method for cash withdrawals and basic banking services. However, the sharp decline starting in 2012 indicates a shift in consumer behavior, likely influenced by the introduction and growing adoption of alternative payment methods, particularly POS and mobile payments. The declining trend from 2012 onwards reflects the gradual shift away from cash-based transactions towards digital and cashless payments, facilitated by the rise of POS terminals and mobile payment platforms. Additionally, issues such as ATM fraud, maintenance challenges, and the cost of ATM transactions might have contributed to the reduced reliance on ATMs.

The value of POS transactions shows an exponential growth trend, starting from N12.72 billion in 2010 and reaching N3,204.75 billion in 2019. Despite a slight decline in 2020, the value of POS transactions continued to rise, reaching N856.86 billion in 2022. The rapid growth in POS transactions reflects the increasing adoption of electronic payment systems in Nigeria, driven by the Central Bank of Nigeria's (CBN) cashless policy and the expansion of POS terminal networks. This trend indicates a significant shift towards cashless transactions, particularly in urban and semi-urban areas where POS terminals became more prevalent. The decline in 2020, likely due to the COVID-19 pandemic, underscores the impact of external factors on transaction volumes. The pandemic disrupted economic activities and reduced consumer spending, which may have contributed to the temporary decline in POS transactions. The recovery and continued growth post-2020 suggest resilience in the adoption of POS technology, supported by the increased digitalization of businesses and consumer preferences for cashless payments.

Mobile payment transactions have shown a generally upward trend, with significant growth starting in 2017. The value of transactions rose from N25.05 billion in 2010 to

N675.92 billion in 2018, though it fluctuated slightly in subsequent years, reaching N120.57 billion in 2022. The early years of mobile payment adoption (2010-2016) saw steady growth, as mobile money services gained acceptance among the unbanked and underbanked populations, particularly in rural areas. The surge in transaction value from 2017 to 2018 reflects the increasing penetration of smartphones, better mobile network coverage, and the entry of new players in the mobile payment space, such as Opay and PalmPay. The slight fluctuations in mobile payment transaction values after 2018 could be attributed to market saturation, regulatory challenges, and competition from other digital payment methods, including POS and internet banking. The overall trend highlights the crucial role of mobile payment platforms in enhancing financial inclusion, particularly by reaching underserved populations who lack access to traditional

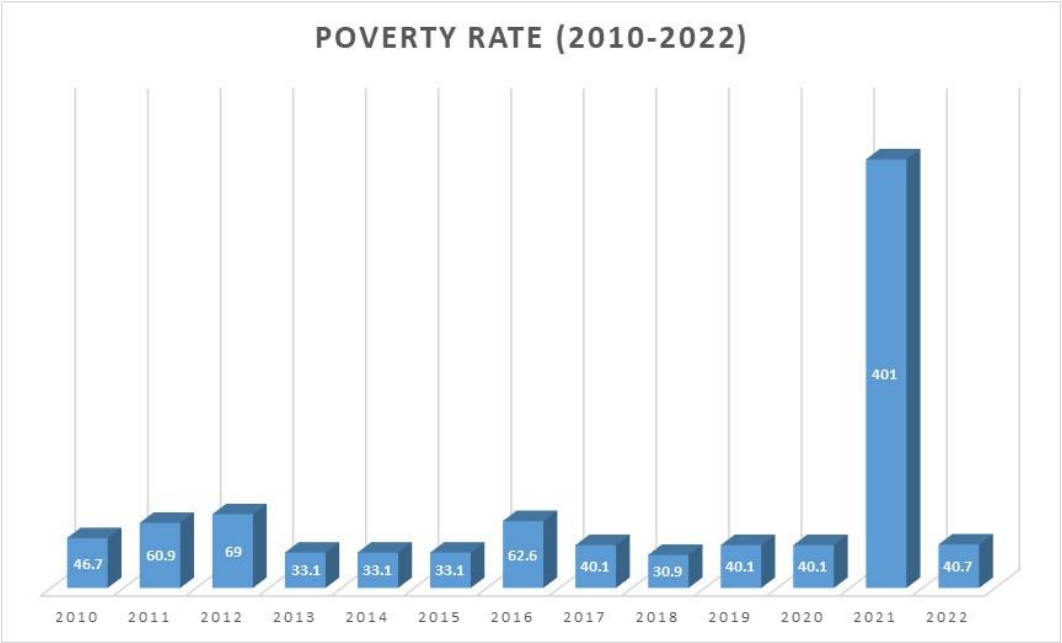
However, despite the progress made, challenges remain in fully realizing the potential of financial inclusion technologies for poverty alleviation in Nigeria. The poverty trend is presented in figure 1 and 2 respectfully and discussed afterwards:

Figure 1: Poverty Trend in Nigeria (2010-2022)



Source: *Central Bank of Nigeria (CBN) Statistical Bulletin 2022*

Figure 2: Bar Charted Poverty Trend in Nigeria (2010-2022)



Source: *Statista and World Development Index (WDI)*

The poverty rate in Nigeria saw a dramatic increase from 46.7% in 2010 to 69.0% in 2012. This spike can be attributed to several factors, including economic instability, rising inflation, and inadequate infrastructure, which disproportionately affected the poorest segments of the population. The high rates during this period reflect the challenges of economic management and the impact of global economic conditions on Nigeria's economy. Following the peak in 2012, the poverty rate fluctuated significantly. By 2013, it dropped to 33.1%, suggesting some recovery efforts were beginning to take effect. However, this recovery was not consistent, as the rate remained at 33.1% in both 2014 and 2015, indicating a stagnation in poverty reduction efforts despite ongoing economic challenges. The poverty rate rose sharply again in 2016 to 62.6%, reflecting the severe economic recession Nigeria faced due to falling oil prices and internal conflicts. This trend highlights the vulnerability of Nigeria's economy, which is heavily reliant on oil exports. The data shows a gradual decline in poverty rates from 2017 to 2019, with rates of 40.1% in both 2017 and 2019. This period indicates some stabilization efforts, but the rates remained alarmingly high, reflecting the ongoing economic struggles and regional disparities, particularly between the northern and southern regions. The poverty rate remained at 40.1% in 2020 and 2021, illustrating the stagnation caused by the COVID-19 pandemic, which severely impacted the economy and exacerbated existing vulnerabilities. The pandemic led to job losses and reduced incomes, pushing more families into poverty. By 2022, the poverty rate was approximately 40.7%, with about 88.4 million Nigerians living in extreme poverty

(Aliu, 2023). This slight increase from previous years underscores the persistent challenges facing the country, including high inflation and inadequate social safety nets.

This research therefore explored the impact of financial inclusion technologies, specifically ATMs, POS, and mobile payment platforms, on poverty alleviation in Nigeria. By examining the extent to which these technologies have enhanced financial access, improved economic opportunities, and contributed to poverty reduction, the study provided insights into the effectiveness of financial inclusion initiatives and identify areas for improvement. The findings contributed to the broader discourse on financial inclusion and its role in achieving sustainable development goals in Nigeria.

LITERATURE REVIEW

Conceptual Review

Automated Teller Machines (ATMs)

ATMs have been a traditional channel for banking services, primarily used for cash withdrawals, balance inquiries, and fund transfers (Ezekiel, Ehiedu, & Onuorah, 2021). Over time, their role in financial inclusion has evolved, particularly in rural areas where physical bank branches are scarce. ATMs provide a critical access point for financial services, allowing users to conduct basic transactions without needing to visit a bank branch. However, the utility of ATMs in promoting financial inclusion is often limited by factors such as poor infrastructure, high operational costs, and security concerns (Ahmad, 2023).

Point of Sale (POS) Terminals

POS terminals have become increasingly significant in Nigeria's cashless economy drive. These devices allow merchants to accept electronic payments for goods and services, thus reducing the reliance on cash (Utomo *et al.* 2024). The widespread adoption of POS terminals has been driven by the CBN's cashless policy, which aims to reduce the amount of physical cash in circulation and encourage digital payments. The growth in POS transactions reflects the expanding role of electronic payments in the economy and their potential to enhance financial inclusion by bringing more people into the formal financial system (Adeolu, Salamntu, & Paschal, 2024).

Mobile Payment Platforms

Mobile payment platforms represent one of the most transformative financial inclusion technologies in Nigeria (Chike & Ogba, 2023). These platforms, including mobile wallets and mobile money services, allow users to conduct a range of financial transactions using their mobile phones. This technology is particularly impactful in reaching unbanked populations, who may not have access to traditional banking infrastructure but do have access to mobile phones. Mobile payments have been credited with enabling greater financial inclusion by providing a convenient, low-cost

means for individuals to save, transfer money, and pay for goods and services (Zaccheaus, 2023).

Impact on Poverty Alleviation

Enhancing Access to Financial Services

One of the key ways financial inclusion technologies contribute to poverty alleviation is by enhancing access to financial services. By providing accessible and affordable financial products, these technologies empower individuals to manage their finances more effectively, save for the future, and invest in income-generating activities. For instance, mobile payment platforms have enabled many Nigerians to access credit and microloans, which they can use to start or expand small businesses (Oladipo & Adebiyi 2022).

Promoting Economic Participation

Financial inclusion technologies also promote broader economic participation by integrating more people into the formal economy. POS terminals, for example, enable small and medium enterprises (SMEs) to accept digital payments, expanding their customer base and increasing sales. This, in turn, supports job creation and income generation, contributing to poverty reduction (Oladipo & Adebiyi 2022).

Facilitating Financial Resilience

By enabling savings and providing access to credit, financial inclusion technologies help individuals build financial resilience. This is particularly important in a country like Nigeria, where many people face economic uncertainty and volatility. Having access to financial services through mobile payment platforms or ATMs allows individuals to save for emergencies, access funds when needed, and reduce their vulnerability to economic shocks (World Bank, 2022).

Theoretical Framework

For a study on the impact of financial inclusion technologies (such as ATMs, POS terminals, and mobile payments) on poverty alleviation in Nigeria, the following two theories or models were applied:

Diffusion of Innovations Theory

The Diffusion of Innovations (DOI) Theory, developed by Everett Rogers in 1962, explains how new ideas, technologies, or practices spread within a society or from one society to another (Rogers, 2003). The theory posits that innovations are adopted through a process that involves different categories of adopters: innovators, early adopters, early majority, late majority, and laggards (Meso & Duncan 2019).

In the context of financial inclusion technologies, the DOI theory can be used to understand how these technologies (e.g., ATMs, POS terminals, and mobile payments) are adopted by different segments of the population in Nigeria. The theory can help

identify the factors that influence the rate of adoption, such as relative advantage, compatibility, complexity, trialability, and observability of the technology.

Amartya Sen's Capability Approach

Amartya Sen's Capability Approach is a theoretical framework that focuses on individuals' capabilities—their ability to do and to be what they value (Sen, 1999). The approach emphasizes the importance of enhancing individuals' freedoms and opportunities to achieve well-being and escape poverty. It argues that poverty should not be measured solely by income levels but by the deprivation of capabilities (Alkire & Deneulin 2009).

The Capability Approach can be used to analyze how financial inclusion technologies enhance or constrain the capabilities of individuals, particularly the poor, in Nigeria. The focus is on how these technologies improve people's ability to access financial services, save money, invest in education or business, and manage risks, thereby improving their overall well-being.

Empirical Studies

Adeyemi and Lawal (2021) examined the relationship between the availability of ATMs and poverty alleviation in Nigeria, using data from 2010 to 2020. The research employs a panel data analysis across different states in Nigeria, focusing on the correlation between the density of ATMs and poverty reduction indicators such as income levels, employment rates, and access to financial services. The study finds that an increase in ATM density is significantly associated with improved access to financial services, particularly in urban and semi-urban areas. The availability of ATMs has contributed to poverty alleviation by facilitating easier access to cash, thereby enabling individuals to manage their finances more effectively. However, the impact is less pronounced in rural areas due to infrastructural challenges and lower levels of ATM penetration.

Ojo and Ibrahim (2022) investigated the role of ATMs in promoting financial inclusion and alleviating poverty in Nigeria's rural economy. The research utilizes a mixed-method approach, combining quantitative analysis of ATM usage data with qualitative interviews of rural residents and financial service providers. The study reveals that ATMs have had a positive impact on financial inclusion in rural areas, particularly by reducing travel time and costs associated with accessing banking services. The presence of ATMs in rural areas has enabled more people to participate in the formal financial system, which has had downstream effects on poverty reduction through increased savings and access to microloans. However, challenges such as frequent machine outages and limited cash availability still hinder the full potential of ATMs in these areas.

Eze and Onuoha (2023) explored the differential impact of ATM accessibility on poverty reduction in urban versus rural areas of Nigeria. Using a dataset covering the period from 2015 to 2023, the research employs econometric modeling to assess how

ATM distribution affects poverty indicators such as income levels, financial inclusion rates, and economic empowerment. The findings indicate that in urban areas, ATMs have significantly contributed to poverty reduction by improving access to financial services, reducing transaction costs, and increasing financial literacy. In rural areas, while there is a positive impact, it is less significant due to factors such as lower ATM density, infrastructural challenges, and lower levels of financial literacy. The study suggests that targeted policies are needed to increase ATM accessibility in rural areas to enhance their impact on poverty alleviation.

Adebayo and Olatunji (2021) explored the relationship between the proliferation of POS terminals and poverty alleviation in Nigeria from 2015 to 2020. The research utilizes a combination of survey data and secondary data on POS transactions across different states in Nigeria. The study assesses how the increased use of POS terminals has influenced financial inclusion, income generation, and poverty levels. The study finds a significant positive correlation between the adoption of POS terminals and poverty reduction, particularly in urban areas where POS usage is more prevalent. POS terminals have improved financial inclusion by making it easier for small and medium-sized enterprises (SMEs) to conduct cashless transactions, thereby increasing their customer base and profitability. The study also highlights the role of POS systems in reducing transaction costs and enhancing access to financial services, which are critical for poverty alleviation.

Nwankwo and Okonkwo (2022) investigated the impact of POS terminals on poverty alleviation in rural Nigeria, focusing on the period from 2018 to 2022. The research employs a qualitative approach, including interviews with rural merchants, customers, and financial service providers. It examines how the introduction of POS terminals in rural areas has affected financial inclusion, economic activities, and poverty levels. The study finds that POS terminals have contributed to poverty alleviation in rural areas by facilitating easier access to financial services, thereby reducing the dependency on cash and enhancing the efficiency of transactions. However, the study also identifies significant challenges, such as poor network connectivity, lack of infrastructure, and limited awareness and trust in electronic payments, which hinder the full potential of POS systems in rural poverty reduction.

Ogunleye and Akinola (2023) analyzed the impact of POS systems on financial access and poverty alleviation in Nigeria, using data from 2016 to 2023. The research employs a panel data approach to examine the effect of POS terminal adoption on various poverty indicators, such as income levels, employment, and access to credit. The results indicate that the adoption of POS systems has a statistically significant impact on reducing poverty, particularly by enhancing access to credit and financial services for underserved populations. The study also highlights the role of POS systems in supporting the growth of microenterprises by enabling them to accept electronic payments, which has led to increased sales and income generation. The findings suggest

that expanding the reach of POS systems, particularly in underserved and remote areas, could further contribute to poverty alleviation in Nigeria.

Adesina and Adeyemi (2021) investigated the impact of mobile payments on poverty alleviation in Nigeria, focusing on the period from 2015 to 2020. The study uses a mixed-method approach, combining quantitative analysis of mobile payment adoption data with qualitative interviews from users and financial service providers. The research examines how mobile payments have influenced financial inclusion and poverty indicators such as income levels, savings, and access to credit. The study finds a significant positive relationship between mobile payment adoption and poverty reduction, particularly in rural areas where traditional banking infrastructure is limited. Mobile payments have enhanced financial inclusion by providing low-cost, accessible financial services to underserved populations, enabling them to save, invest, and manage financial risks more effectively.

Ekezie and Nwokolo (2022) examined the role of mobile money services in enhancing financial inclusion and alleviating poverty in Nigeria, focusing on the period from 2018 to 2022. The study employs a panel data approach to analyze the relationship between mobile money usage and poverty indicators across different states in Nigeria. It also considers the factors that influence the adoption of mobile money services, such as income levels, education, and mobile phone ownership. The results indicate that mobile money services have significantly contributed to poverty alleviation by increasing access to financial services, particularly in remote and rural areas. The study finds that mobile money has facilitated savings, improved access to credit, and enabled efficient money transfers, all of which have contributed to poverty reduction.

Okoye and Chima (2023) explores the role of mobile payments in poverty alleviation in Nigeria, using data from 2017 to 2023. The research utilizes econometric modeling to analyze the impact of mobile payment adoption on poverty-related indicators, including income levels, household consumption, and access to financial services. The study also conducts a comparative analysis between urban and rural areas to assess the differential impact of mobile payments on poverty alleviation. The study finds that mobile payments have had a substantial impact on poverty alleviation, particularly by increasing financial access for low-income households and small-scale entrepreneurs. Mobile payments have enabled users to receive remittances, pay bills, and conduct transactions more efficiently, thereby reducing transaction costs and increasing disposable income.

METHODOLOGY

Research Design

The investigation employed the *Ex Post Facto* design given that the study is anchored on the utilization of secondary data. This study makes use of econometric procedure in the impact of financial inclusion technologies on poverty reduction in Nigeria. linear

regression with the application of Ordinary least squares (OLS) technique was adopted for the study. The primary justification for adopting the linear regression is based on the fact that it possesses the optimal properties of linearity, unbiasedness, linearity and minimum variance (Koutsoyiannis, 2003).

Pre-Estimation Tests

Unit Root Test

In order to avoid spurious regression estimates, a time series data should be examined for stationarity or order of integration. Time series data is accepted to be stationary if "it exhibits mean reversion in that it fluctuates around a constant long-run mean, has a finite variance that is time invariant and has a theoretical correlogram that diminishes as the lag length increases" (Asteriou, 2006). There are many tests trying to find the order of integration of series and among them Dickey-Fuller, Augmented Dickey-Fuller and Phillips and Perron tests are the most widely used ones in testing the presence of unit roots. Dickey-Fuller (DF) test is based on the following model:

$$\Psi_t = \lambda \Psi_{t-1} + \varepsilon_t \qquad (1)$$

The model can also be expressed as:

$$\Delta\psi_t = \varpi\psi_{t-1} + \varepsilon_t \qquad (2)$$

where $\varpi = (\lambda - 1)$. This model is called pure random walk model. Null hypotheses are $H_0 : \lambda = 1$ for model (3.4.1) and $H_0 : \varpi = 0$ for model (2). The corresponding alternative hypotheses are $H_a : \lambda < 1$ and $H_a : \varpi < 1$ respectively. If DF test statistic (t-statistic of lagged dependent variable) is less than the critical value, we reject the null hypothesis and conclude that the series is stationary (there is no unit root). Model (2) can be extended by including a constant term and/or the trend.

The corresponding models are called random walk with drift and random walk with drift and time trend:

$$\Delta\psi_t = \alpha_0 + \Omega\psi_{t-1} + \varepsilon_t$$

$$\Delta\Psi_t = \alpha_0 + \beta_2 t + \Omega\Psi_{t-1} + \varepsilon_t$$

Where: $\Omega = (\lambda - 1)$. The two models have same testing procedures with the random walk model.

However, Equation (3.4.2) does not consider autocorrelation. Augmented Dickey-Fuller (ADF) test is used to test existence of unit root when there is autocorrelation in the series and lagged terms of the dependent variable are included in the equation. The following three models represent pure random walk, random walk with drift and random walk with drift and trend used in Augmented Dickey Fuller tests:\

$$\Delta\psi_t = \Omega\psi_{t-1} + \sum_{i=1}^{p} \beta_i \Delta\psi_{t-1} + \varepsilon_t$$

$$\Delta\psi_t = \alpha_0 + \Omega\psi_{t-1} + \sum_{i=1}^{p} \beta_i \Delta\psi_{t-i} + \varepsilon_t$$

$$\Delta\psi_t = \alpha_0 + \Omega\Psi + \beta_2 t + \sum_{i=1}^{p} \beta_i \Delta\psi_{t-1} + \varepsilon_t$$

where: $\Omega = (\lambda - 1)$ The null hypothesis is $H_0 : \Omega = 0$ and the alternative hypothesis is $H_a : \Omega < 0$ If ADF test statistic (t-statistic of lagged dependent variable) is less than the critical value, we reject the null hypothesis and conclude that the series is stationary (there is no unit root).

Cointegration Test

The co-integration technique allows for the estimation of a long-run equilibrium relationship. Simply put, one can argue that various non-stationarity time series are co-integrated when their linear combinations are stationary. One of the most popular tests for cointegration has been suggested by Engel and Granger (1987). The process is demonstrated thus; given a multiple regression: $y_t = \beta' x_t + \mu_t, t = 1,..., T,$ where $x_t = (x_{1t}, x_{2t},..., x_{kt})'$ is the k-dimensional I(1) regressors. For y_t and x_t to be cointegrated, μ_t must be I(0). Otherwise, it is spurious. Thus, a basic idea is to test whether μ_t is I(0) or I(1).

The Model

The error correction analysis is an econometric analysis carried out if the variables under investigation are seen to be cointegrated. The Error Correction Mechanism (ECM) was used to estimate the speed of adjustment of the short-run dynamics of the variables and timing to long run convergence. The ECM is given by the equation:
$\Delta PR_t = \beta_0 + \Delta\beta_1 POS_t + \Delta\beta_2 ATM_t + \Delta\beta_3 MOP_t + \Delta\beta_4 FD_t + ECM_{t-1} + \mu_t \ldots 4$
Where Δ = First Difference Operator

Model Specification

The guiding econometric model for this research is specified thus:
Implicitly: $PR_t = f(POS_t, ATM_t, MOP_t, FD,)$ (3)
The explicit econometric model is specified thus:

$$PR_t = \beta_0 + \beta_1 POS_t + \beta_2 ATM_t + \beta_3 MOP_t + \beta_4 FD_t + \mu_t \quad (4)$$

Where:
PR = Poverty Rate (Head Count)
POS = Point of Sales (Value of Transactions)

ATM = Automated Teller Machines (Value of Transactions)
MOP = Mobile Pay (Value of Transactions)
FD = Financial Deepening (measured with the ratio of broad money supply to GDP)
t = Time Period\

β 's = structural Parameters to be estimated

μ = Stochastic Error Term

The a priori expectations are given as: $\beta_1 > 0$, $\beta_2 > 0$, $\beta_3 > 0$, & $\beta_4 > 0$.

RESULTS AND DISCUSSION

Unit Root Results

Table 2: Unit Root Results

	Level Form		Differenced Form		
VARIABLE	**ADF STAT**	**CRITICAL VAL @5%**	**ADF STAT.**	**CRITICAL VAL @5%**	**ORDER OF INTEGRATION**
POS	-0.459372	-2.941145	-9.272254	-2.941145	I(1)
ATM	-1.266202	-1.949609	-17.68324	-1.949856	I(1)
MOP	-0.676244	-2.941145	-6.986401	-2.943427	I(1)
FD	-1.345052	-2.938987	-7.192507	-2.943427	I(1)
POVR	-2.482046	-2.943427	-3.055353	-1.951687	I(1)

Source: *Author's Computation Using E-views 10.*

Table 4.1 clearly shows that all the variables are stationary at first difference (I(1)). This means that the variables have unit-root until differenced in the first order. This was also strengthened by the correlogram analysis. This, therefore, necessitated the need to estimate the model using Error Correction Model (ECM).

Table 3: Error Correction Model Analysis

Dependent Variable: POVR
Included observations: 13

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.76158	3.133283	3.753757	0.0071
POS	0.273004	0.279986	0.975063	0.3620
ATM	-0.227897	0.138258	-1.648350	0.1433
MOP	-0.424483	0.319033	-1.330532	0.2250
FD	-0.243817	0.150681	-1.618104	0.1497
ECM-1	0.006192	0.000954	6.489605	0.0003
R-squared	0.897601	Mean dependent var		3.925194

Adjusted R-squared	0.824460	S.D. dependent var	0.674567
S.E. of regression	0.282627	Akaike info criterion	0.614659
Sum squared resid	0.559145	Schwarz criterion	0.875404
Log likelihood	2.004719	Hannan-Quinn criter.	0.561064
F-statistic	12.27207	Durbin-Watson stat	2.481792
Prob(F-statistic)	0.002355		

Source: Researcher's Computation Using E-views Software.

Table 3 clearly shows that POS yielded a numerical coefficient of 0.273004. This result implies that POS for the years analyzed did not have a reductive effect on poverty in Nigeria. The lack of impact might indicate that the infrastructure supporting POS systems, such as reliable electricity, internet connectivity, and financial literacy, is insufficient, particularly in rural and underserved areas. Policymakers may need to focus on improving these foundational elements to enhance the effectiveness of POS systems in poverty reduction.

ATM yielded a negative numerical coefficient of -0.27897. This entails that ATM facilitates the reduction of poverty in Nigeria. A 1% increase in ATM availability resulted in a 0.27% decrease in poverty in Nigeria. The positive impact of ATMs on poverty reduction suggests that expanding ATM infrastructure, particularly in underserved and rural areas, could further enhance financial inclusion and contribute to poverty alleviation. Policymakers may consider incentivizing banks and financial institutions to install more ATMs in areas with limited access to financial services.

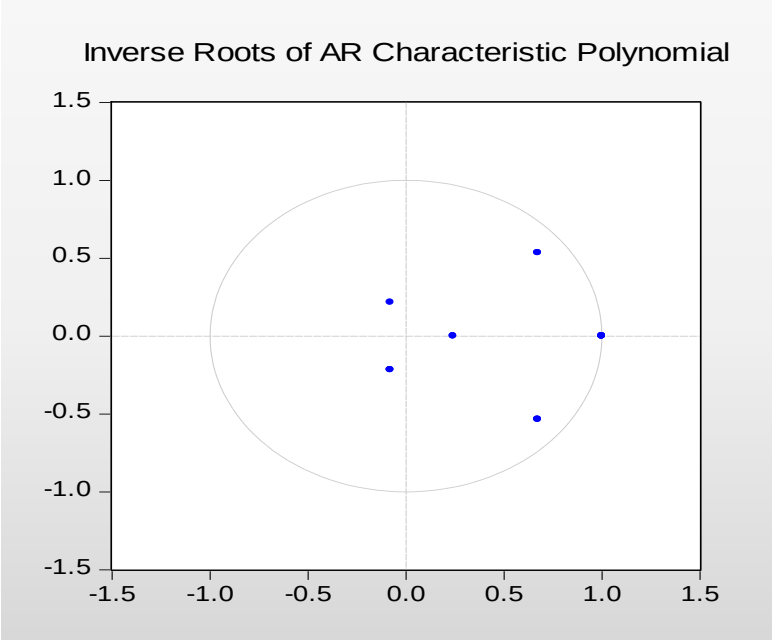
Mobile Pay (MOP) also yielded a negative numerical coefficient of -0.424483. This entails that MOP facilitates the reduction of poverty in Nigeria. A 1% increase in MOP availability resulted in a 0.42% decrease in poverty in Nigeria. The finding suggests that mobile payment systems are effective tools for financial inclusion. Policymakers should therefore prioritize expanding access to mobile payment platforms, particularly in rural and underserved areas. This could involve incentivizing mobile network operators and fintech companies to invest in infrastructure and services that make mobile payments more accessible to low-income populations.

Finally, financial deepening (FD) yielded a negative numerical coefficient at the magnitude of -0.243817. This entails that FD facilitates the reduction of poverty in Nigeria. A 1% increase in financial depth resulted in a 0.24% decrease in poverty in Nigeria. The finding underscores the importance of continuing efforts to deepen the financial sector in Nigeria.

The coefficient of determination (R-Squared) yielded 0.897601. This entails that approximately 90% of the variations of the dependent variable is explained by changes

in the independent variables. This is however high as it is above average (50%). The F-statistics is a statistical tool employed in checking the statistical significance of the entire regression plane. From the regression, it can be clearly seen that the F-statistics yielded 12.27207 with a corresponding probability value of 0.002355. This means that the test is statistically significant in the entire regression plane.

Model Stability (AR Unit-Circle)
Table 4



Source: *Researcher's Computation Using E-views 10.*

The importance of evaluating the stability of a model cannot be overemphasized. This is to ensure the model is dynamically stable. The condition for stability is that no inverse root dot should be outside the unit circle. Judging from the inverse roots of the AR characteristic polynomial, the model is stable as no dot lies outside the enclave of the unit circle.

Discussion of Results
Findings from the study revealed that POS did not contribute positively to poverty in Nigeria. The findings suggest that there may be barriers to the effective adoption and use of POS systems, such as lack of trust in digital transactions, limited access to POS devices in certain regions, or high transaction fees. This finding does not however align with findings of Adebayo and Olatunji (2021) who explored the relationship between the proliferation of POS terminals and poverty alleviation in Nigeria from 2015 to 2020 and found a significant positive correlation between the adoption of POS terminals and poverty reduction, particularly in urban areas where POS usage is more prevalent. The

finding did not also agree with the finding of Nwankwo and Okonkwo (2022) who investigated the impact of POS terminals on poverty alleviation in rural Nigeria, focusing on the period from 2018 to 2022.

The study also found out that ATM contributes positively to poverty reduction in Nigeria. This finding is in tandem with the findings of Adeyemi and Lawal (2021) who examined the relationship between the availability of ATMs and poverty alleviation in Nigeria, using data from 2010 to 2020. It also agrees with the findings of Ojo and Ibrahim (2022) who investigated the role of ATMs in promoting financial inclusion and alleviating poverty in Nigeria's rural economy and found out that ATMs have had a positive impact on financial inclusion in rural areas, particularly by reducing travel time and costs associated with accessing banking services.

The study also discovered that mobile pay contributes positively to poverty reduction in Nigeria for the years analyzed. This finding is in line with the results obtained from Adesina and Adeyemi (2021) who investigated the impact of mobile payments on poverty alleviation in Nigeria, focusing on the period from 2015 to 2020 and a significant positive relationship between mobile payment adoption and poverty reduction, particularly in rural areas where traditional banking infrastructure is limited. The finding also aligns with the findings of Okoye and Chima (2023) who explored the role of mobile payments in poverty alleviation in Nigeria, using data from 2017 to 2023. The study finds that mobile payments have had a substantial impact on poverty alleviation, particularly by increasing financial access for low-income households and small-scale entrepreneurs.

Conclusion and Recommendations

The findings underscore the critical role that financial inclusion and deepening play in reducing poverty in Nigeria. While ATMs and mobile payments have proven effective in reaching and benefiting low-income populations, the limited impact of POS systems suggests the need for a more nuanced approach to financial inclusion strategies. To maximize the poverty-reducing potential of financial technologies, stakeholders—including policymakers, financial institutions, and technology providers—must continue to invest in expanding access to financial services, particularly in underserved regions. Moreover, efforts to enhance financial literacy and infrastructure are crucial to ensure that these services are not only available but also effectively utilized by those most in need. Ultimately, a comprehensive and inclusive approach to financial sector development, leveraging the strengths of various financial technologies, will be essential in driving sustainable poverty reduction and fostering economic growth in Nigeria.

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