FINANCIAL INCLUSION AND ECONOMIC DEVELOPMENT IN NORTHERN NIGERIA: EMPIRICAL EVIDENCE AND POLICY IMPLICATIONS

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Abstract

This study investigates the relationship between financial inclusion and economic development in Northern Nigeria using quarterly secondary data from 2012 to 2024, focusing on ten states with the highest multidimensional poverty rates. Financial inclusion indicators include bank branches per capita, ATM penetration, mobile money usage, and rural loans, while economic development is measured by GDP per capita, poverty rates, employment, and household income. Unit root tests reveal mixed orders of integration among the variables, justifying the use of the Autoregressive Distributed Lag (ARDL) approach. The bounds test confirms a stable long-run cointegrating relationship between financial inclusion and economic development. Long-run ARDL estimates indicate that bank branches, ATM penetration, and rural loans positively affect economic development but are statistically insignificant, suggesting limited impact of traditional financial inclusion channels, whereas mobile money usage has a negative and marginally significant effect, implying that it is mainly used for consumption rather than productive investment. Short-run results show that the lagged dependent variable is significant and the error correction term is negative and statistically significant, with approximately 50 percent of deviations from long-run equilibrium corrected within one quarter, indicating a relatively fast speed of adjustment toward a stable long-run relationship. Post-estimation diagnostics confirm model robustness, showing no serial correlation, heteroscedasticity, or non-normality. Based on these findings, the study recommends that policies not only expand access to financial services but also promote their productive use through entrepreneurship programs and investment incentives; enhance financial literacy for low-income and rural populations; and strengthen institutional and regulatory frameworks to improve transparency, credit allocation, and monitoring of financial services.

Keywords: *Financial Inclusion; Economic Development; Northern Nigeria; Financial Intermediation; Poverty Reduction*

JEL Classification: *G20, O16, O18, R11, I32*

1.0 Introduction

Financial inclusion is widely recognized as a crucial driver of economic development, particularly in developing economies where access to formal financial services remains limited.

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It refers to the availability and effective use of affordable financial products such as savings, credit, insurance, and payment services by individuals and businesses (World Bank, 2022). An inclusive financial system enhances savings mobilization, promotes investment, supports entrepreneurship, and facilitates poverty reduction by integrating excluded populations into formal economic activities (Demirgüç-Kunt *et al.,* 2018). Empirical studies further suggest that financial inclusion strengthens economic resilience and contributes to long-term growth by improving resource allocation and reducing income inequality (Sahay *et al.,* 2015).

In Nigeria, despite sustained policy efforts such as the National Financial Inclusion Strategy, access to formal financial services remains uneven across regions. Northern Nigeria, in particular, records persistently low levels of financial inclusion, accompanied by high poverty incidence, unemployment, and economic vulnerability (EFInA, 2023; CBN, 2023). Structural constraints including weak financial infrastructure, low literacy levels, insecurity, and socio-cultural factors have significantly limited the participation of households and small businesses in the formal financial system. As a result, savings and credit mobilization remain weak, productive investment is constrained, and the region's capacity to achieve broad-based economic development is undermined (World Bank, 2023).

The key problem motivating this study is the limited region-specific empirical evidence on the extent to which financial inclusion contributes to economic development in Northern Nigeria, despite the region's unique socio-economic challenges. Most existing studies focus on national-level analyses, thereby masking important regional dynamics and weakening policy relevance (Adeola & Evans, 2017; Ozili, 2021). Against this backdrop, the main objective of this study is to empirically examine the impact of financial inclusion on economic development in Northern Nigeria and draw relevant policy implications. This paper is structured into five sections: introduction, literature review, methodology, results and presentation, and conclusion and recommendation.

2.0 Literature Review/Theoretical Framework

2.1 Conceptual Clarification

2.1.1 Financial Inclusion

Financial inclusion refers to the availability, accessibility, and effective usage of formal financial services such as savings, credit, insurance, and payment systems by individuals and businesses, particularly those traditionally excluded from the formal financial sector. It goes beyond mere access to bank accounts to include the quality, affordability, and sustainability of financial services that meet users' needs (Demirgüç-Kunt *et al.,* 2018). In developing economies like Nigeria, financial inclusion is critical for mobilizing savings, facilitating investment, and integrating informal economic activities into the formal financial system. Empirical evidence shows that higher levels of financial inclusion enhance household welfare, promote entrepreneurship, and reduce vulnerability to economic shocks (Sahay *et al.,* 2015).

2.1.2 Economic Development

Economic development is a multidimensional concept that encompasses sustained improvements in income levels, employment opportunities, poverty reduction, and overall quality of life. Unlike economic growth, which focuses mainly on increases in output or income, economic development emphasizes structural transformation, human capital development, and equitable distribution of economic benefits (Todaro & Smith, 2020). In the context of Northern Nigeria, economic development involves expanding productive employment, reducing poverty, and improving access to basic services. Studies suggest that inclusive financial systems play a vital role in supporting development by enhancing capital formation and enabling broader participation in economic activities (World Bank, 2023).

2.1.3 Financial Inclusion and Economic Development Nexus

The relationship between financial inclusion and economic development is grounded in financial intermediation and endogenous growth theories, which posit that efficient financial systems enhance resource allocation and stimulate productive investment. Financial inclusion facilitates economic development by easing credit constraints, supporting small and medium-scale enterprises, and promoting income-generating activities among low-income households (Beck, Demirgüç-Kunt, & Levine, 2007). In regions such as Northern Nigeria, where financial exclusion is widespread, expanding access to formal financial services can enhance savings mobilization, improve employment outcomes, and accelerate poverty reduction. Empirical studies across developing economies consistently find a positive and significant link between financial inclusion and economic development outcomes (Ozili, 2021).

2.2 Theoretical Literature

2.2.1 Financial Intermediation Theory

Financial Intermediation Theory explains how financial institutions facilitate economic development by mobilizing savings, allocating credit efficiently, reducing transaction costs, and mitigating information asymmetry between savers and borrowers (Gurley & Shaw, 1960). The theory posits that a well-functioning and inclusive financial system enhances productive investment and economic performance by channeling funds to sectors with the highest returns. In the context of financial inclusion, expanding access to formal financial services allows previously excluded households and small enterprises to participate in the financial system, thereby strengthening intermediation efficiency. In regions such as Northern Nigeria, where informal finance dominates, improved financial intermediation through inclusive banking and digital finance can stimulate investment, entrepreneurship, and employment, contributing to broader economic development (Beck, Demirgüç-Kunt, & Levine, 2007).

2.2.3 Endogenous Growth Theory

Endogenous Growth Theory provides a theoretical justification for the long-run impact of financial inclusion on economic development by emphasizing the role of internal factors such as human capital, innovation, and financial system efficiency in driving growth (Romer, 1990). Unlike neoclassical models that treat technological progress as exogenous, this theory argues that economic development is sustained through deliberate investments in education, skills, and innovation, all of which require access to finance. Financial inclusion enhances economic development by enabling individuals and firms to invest in productive activities, accumulate human capital, and adopt new technologies. In Northern Nigeria, increased access to credit and savings facilities can support entrepreneurship, improve productivity, and foster inclusive economic development (Aghion & Howitt, 1998).

2.2.4 Financial Development Theory

Financial Development Theory emphasizes the role of a deep, efficient, and inclusive financial system in promoting economic development by supporting capital accumulation and entrepreneurial activities. Schumpeter (1911) argued that financial institutions are essential for funding innovation and facilitating economic transformation. According to this theory, financial inclusion strengthens financial development by broadening the financial base, increasing savings mobilization, and improving access to credit for small and medium-sized enterprises. Empirical evidence suggests that countries with more developed and inclusive financial systems experience higher levels of economic development due to improved resource allocation and enhanced investment efficiency (Levine, 2005). In Northern Nigeria, expanding financial inclusion can deepen financial development, stimulate enterprise growth, and support structural transformation.

2.3 Theoretical Framework

The study is anchored on Financial Intermediation Theory (Gurley & Shaw, 1960; Beck, Demirgüç-Kunt, & Levine, 2007), which provides a clear and practical framework for understanding how financial inclusion drives economic development. The theory posits that financial institutions act as intermediaries between savers and borrowers, efficiently mobilizing resources, allocating credit, and reducing transaction costs and information asymmetries. In the context of Northern Nigeria, where a large proportion of households and small businesses remain excluded from formal financial services, expanding access to banking, credit, and digital financial platforms enhances financial intermediation, promotes savings mobilization, stimulates entrepreneurial activity, and facilitates investment. These processes collectively improve household welfare and support broader economic development. Compared to broader frameworks such as Endogenous Growth Theory or Financial Development Theory, Financial Intermediation Theory is particularly suitable for this study because it directly captures the operational mechanisms through which financial inclusion affects economic outcomes, making it an ideal anchor for analyzing the link between financial services accessibility and regional economic growth in Northern Nigeria.

2.4 Empirical Literature

Empirical evidence consistently demonstrates that financial inclusion significantly contributes to economic development in Nigeria and across Sub-Saharan Africa. Several studies highlight that access to financial services measured through bank branch penetration, credit to the private sector, mobile transactions, and rural loans positively influences economic growth, employment generation, and poverty reduction. Afolabi (2020) found that rural loans, bank branch penetration, and money supply positively impacted inclusive growth, while interest rates constrained it. Similarly, Musa and Bello (2024) showed that credit to the private sector significantly supported economic growth, whereas transactional infrastructure such as ATM usage alone was less effective. Okoro and Adekunle (2024) further demonstrated that positive shocks to banking infrastructure and money supply could stimulate GDP growth, but persistent poverty could undermine these gains, emphasizing the importance of integrated inclusion and poverty alleviation policies. Nteegah (2021) confirmed that financial inclusion reduced unemployment in the short run, with sustained bank branch access proving crucial for long-term employment benefits. Aribaba *et al.* (2020) also noted that targeted inclusion schemes, such as rural and social investment loans, significantly improved per capita income and reduced poverty, highlighting the need for policies that extend financial services to low-income households.

Beyond Nigeria, cross-country evidence in Sub-Saharan Africa supports the growth-promoting role of financial inclusion. Oyelude *et al*. (2023) found that higher financial inclusion indicators, including accounts per capita, bank branches, and electronic transactions, were positively associated with economic growth and exhibited bidirectional causality, indicating mutual reinforcement between inclusion and growth. Raji (2023) emphasized that the effectiveness of inclusion depends on institutional quality, showing that government effectiveness and regulatory quality enhance the positive impact of financial services on inclusive growth. Ofoama *et al.* (2023) further highlighted the importance of targeted strategies, demonstrating that SME lending and rural banking operations strongly contributed to GDP growth and foreign reserves. Collectively, these studies suggest that financial inclusion can drive sustainable development, but its effectiveness is contingent on complementary interventions, including governance improvements, poverty reduction initiatives, and sector-specific support, providing a clear framework for policy considerations in regions such as Northern Nigeria.

3.0 Methodology

3.1 Research Design

The study will adopt a quantitative research design with an explanatory and causal-comparative approach to empirically examine the relationship between financial inclusion and economic development in Northern Nigeria. This design is suitable because it allows the researcher to test hypotheses, determine the direction and magnitude of relationships, and establish causal links between financial inclusion variables and economic development indicators (Creswell & Creswell, 2018).

3.2 Population

The population for this study comprises the 19 Northern Nigerian states, focusing on the economically active adult population and formal financial institutions operating within these states. This includes all individuals and institutions engaged in, or facilitating, financial activities relevant to financial inclusion. By considering

both the adult population and financial institutions, the study captures the full spectrum of interactions that influence financial inclusion and its impact on economic development.

Table 1: Population (19 Northern States) and Multidimensional Poverty Rate

S/N	State	Zone	Poverty Rate (%)
1	Sokoto	North West	90.5
2	Jigawa	North West	84.3
3	Zamfara	North West	78.0
4	Katsina	North West	72.7
5	Kano	North West	66.3
6	Kebbi	North West	82.2
7	Kaduna	North West	73.9
8	Bauchi	North East	73.9
9	Yobe	North East	83.5
10	Borno	North East	72.5
11	Gombe	North East	86.2
12	Adamawa	North East	68.7
13	Taraba	North East	79.4
14	Niger	North Central	69.1
15	Benue	North Central	75.0
16	Plateau	North Central	84.0
17	Nasarawa	North Central	60.7
18	Kogi	North Central	61.3
19	Kwara	North Central	48.3

Source: *National Bureau of Statistics (NBS), 2022 NMPI*

3.3 Sample Population

A purposive sampling technique will be employed to select a representative sample of 10 states with the highest dimensional poverty rates. These states are likely to be most affected by financial inclusion policies, making them ideal for examining the relationship between access to financial services and economic development outcomes. Data for the study will be drawn from multiple credible sources, including the Central Bank of Nigeria (CBN) records, National Bureau of Statistics (NBS), Enhancing Financial

Innovation & Access (EFInA) reports, and World Bank datasets. The selection of these states allows for focused and meaningful analysis while ensuring that the findings are relevant to regions with significant developmental challenges.

Table 2: Sample Population – 10 Most Severe States

S/N	State	Zone	Poverty Rate (%)
1	Sokoto	North West	90.5
2	Gombe	North East	86.2
3	Jigawa	North West	84.3
4	Plateau	North Central	84.0
5	Yobe	North East	83.5
6	Kebbi	North West	82.2
7	Taraba	North East	79.4
8	Zamfara	North West	78.0
9	Benue	North Central	75.0
10	Bauchi	North East	73.9

Source: *National Bureau of Statistics (NBS), 2022 NMPI*

3.4 Justification for Selecting the 10 States

i. The selection of the 10 states with the highest dimensional poverty rates is grounded in both theoretical and practical considerations. First, areas with higher poverty levels are more likely to experience financial exclusion, as low-income households often lack access to formal banking services, credit facilities, and digital financial platforms (Demirgüç-Kunt *et al.,* 2018). Focusing on these states ensures that the study captures the population most affected by gaps in financial inclusion, making the analysis more relevant and impactful.

ii. Second, studying states with high poverty rates allows for a clearer assessment of the relationship between financial inclusion and economic development outcomes. Since poverty reduction is a central component of economic development, examining states where poverty is most pronounced provides valuable insights into how access to financial services can improve household welfare, entrepreneurship, and income generation (*Sahay et al*., 2015; Ozili, 2021).

iii. Third, practical considerations such as data availability also justify this selection. The Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), EFInA, and World Bank provide reliable and disaggregated data for these states, which is essential for rigorous quantitative analysis. By purposively selecting states most affected by financial exclusion, the study ensures that the findings are both policy-relevant and generalizable to similar high-poverty contexts in Northern Nigeria.

3.5 Source of Data

The study will use secondary data, including both time-series data (2012–2024) and cross-sectional data using quarterly data, to examine financial inclusion and economic development in Northern Nigeria. Financial inclusion indicators will include bank branches per capita, ATM penetration, mobile money usage, and rural loans, while economic development indicators will include GDP per capita, poverty rates, employment levels, and household income. Data on financial inclusion will be obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, Enhancing Financial Innovation & Access (EFInA) Reports, and World Bank Global Findex Database. Economic development data will be sourced from the National Bureau of Statistics (NBS) Annual Abstracts, World Bank World Development Indicators (WDI), and United Nations Development Programme (UNDP) Human Development Reports. Using these secondary sources ensures reliability, consistency, and comprehensive temporal and regional coverage for the study.

Table 3: Variables and Measurement

Variable	Indicator/Proxy	Unit of Measurement	Data Source
Economic Development (ED)	Real GDP per capita	Nigeria Naira (NGN)	NBS Annual Abstracts, World Bank Development Indicator (WDI)
Bank Branches (BBR)	Number of commercial bank branches per 100,000 adults	Count per 100,000 adults	Central Bank of Nigeria (CBN) Statistical Bulletin
ATM Penetration (ATMP)	Number of automated teller machines per 100,000 adults	Count per 100,000 adults	CBN Statistical Bulletin
Mobile Money Usage (MMU)	Number of registered mobile money accounts / annual transaction volumes	Accounts / Transactions per year	EFInA Reports, World Bank Global Findex Database
Rural Loans (RLON)	Total amount of credit disbursed to rural areas	Nigerian Naira (NGN)	CBN Statistical Bulletin, EFInA Reports

Source: *Author Computation (2025)*

3.6 Model Specification

This study utilizes the Auto-Regressive Distributed Lag (ARDL) model. The model created by Pasaran and Shin (1999) is considered effective in capturing relationships between variables of various degrees of integration, meaning it estimates a model containing a combination of I(0) and I(1) variables. It features the benefits of being a singular equation model, which makes it easy to interpret and apply; furthermore, various variables can be assigned distinct lag lengths and they enter the model (Pesaran et al., 2001). Due to its capacity to handle and assess variables with varying orders of integration (i.e., a combination of I(0) and

I(1)), it can effectively estimate both short-run and long-run relationships within a specific model. The ARDL formulated by Pasaran and Shin (1999) is outlined as follows;

$$ED_t = f(BBR_t, ATMP_t, MMU_t, RLON_t) \quad (3.1)$$

Transform equation (3.1) into econometric model

$$ED_t = \beta_0 + \beta_1 BBR_t + \beta_2 ATMP_t + \beta_3 MMU_t + \beta_4 RLON_t + \mu_t \quad (3.2)$$

where; Economic Development (ED) Real GDP per capita, Bank Branches (BBR) Number of commercial bank branches per 100,000 adults, ATM Penetration (ATMP) Number of ATMs per 100,000 adults, Mobile Money Usage (MMU) Registered mobile money accounts / transactions, Rural Loans (RLON) Total rural credit disburse.

Transformed 3.2 to the ARDL specification as;

$$\Delta lnED_t = \theta_0 + \theta_1 lnED_{t-1} + \alpha_1 lnBBR_{t-1} + \alpha_2 lnATMP_{t-1} + \alpha_3 lnMMU_{t-1} + \alpha_4 lnRLON_{t-1} + \sum_{i=1}^{b} \beta_1 \Delta lnED_{t-1} + \sum_{i=1}^{b} \beta_2 \Delta lnBBR_{t-1} + \sum_{i=1}^{b} \beta_3 \Delta lnATMP_{t-1} + \sum_{i=1}^{b} \beta_4 \Delta lnMMU_{t-1} + \sum_{i=1}^{b} \beta_5 \Delta lnRLON_{t-1} + \varepsilon_t \quad (3.3)$$

The initial segment of the equation, absent Δ, signifies long-term dynamics, whereas the subsequent segment, including Δ, signifies short-term dynamics. The bounds testing method is employed to determine the cointegration of the variables prior to estimating the equation. To assess the short-run adjustment towards equilibrium, the Error Correction Model (ECM) is defined in Equation 3.4 .

$$\Delta \ln ED_t = \theta_0 + \sum_{i=1}^{b} \beta_1 \Delta \ln ED_{t-1} + \sum_{i=1}^{b} \beta_2 \Delta \ln BBR_{t-1} + \sum_{i=1}^{b} \beta_3 \Delta \ln ATMP_{t-1} + \sum_{i=1}^{b} \beta_4 \Delta \ln MMU_{t-1} + \sum_{i=1}^{b} \beta_5 \Delta \ln RLON_{t-1} + \delta ECM_{t-1} + \varepsilon_t \quad (3.4)$$

Where δ represents the speed of adjustment of the parameters toward long-run equilibrium following a shock to the system, and $ECMt{-}1$ is the error correction term.

4.0 Results and Presentation

Table 4: Descriptive Statistics

	ED	BBR	ATMP	MMU	RLON
Mean	384930.1	26.17404	20.58596	25523.81	12935264
Median	379244.5	26.73500	18.04500	29079.50	13438324
Maximum	587963.9	49.41000	39.45000	46900.00	19595158
Minimum	208233.8	5.250000	2.260000	1451.000	5075924.
Std. Dev.	118259.7	13.43634	11.59183	14368.96	4439973.
Skewness	0.230796	0.003653	0.240175	-0.163055	-0.081767
Kurtosis	1.823503	1.687016	1.669655	1.679407	1.804515
Jarque-Bera	3.460628	3.735291	4.334536	4.009013	3.154509
Probability	0.177229	0.154487	0.114490	0.134727	0.206541
Sum	20016365	1361.050	1070.470	1327238.	6.73E+08
Sum Sq. Dev.	7.13E+11	9207.291	6852.896	1.05E+10	1.01E+15
Observations	52	52	52	52	52

Source: *Author Computation (2025)*

The descriptive statistics in Table 4 reveal variations in economic development and financial inclusion indicators across the 52 observations in Northern Nigeria. Economic Development (ED), measured as real GDP per capita, has a mean of 384,930.1 and a median of 379,244.5, with a standard deviation of 118,259.7, indicating considerable differences in income levels across states. Bank Branches (BBR), representing the number of commercial bank branches per 100,000 adults, and ATM Penetration (ATMP), the number of ATMs per 100,000 adults, have means of 26.17 and 20.59, respectively, with moderate variability, reflecting uneven access to formal banking infrastructure. Mobile Money Usage (MMU), measured by registered mobile money accounts and transactions, and Rural Loans (RLON), the total rural credit disbursed, show wider dispersion, with means of 25,523.81 and 12,935,264, respectively, highlighting disparities in the adoption of digital financial services and rural credit allocation. Skewness values close to zero indicate relatively symmetric distributions for all variables, while kurtosis values below 3 suggest slightly flatter distributions. The Jarque-Bera tests, with p-values exceeding 0.05, confirm approximate normality of the data. These statistics suggest significant heterogeneity in financial inclusion and economic development across Northern Nigerian states, emphasizing the importance of targeted policies to improve financial access, enhance rural credit provision, and stimulate inclusive economic growth.

Table 5: Correlation Matrix

	ED	BBR	ATMP	MMU	RLON
ED	1.000000				
BBR	-0.523534	1.000000			
ATMP	0.686758	0.628890	1.000000		
MMU	-0.792634	0.322975	-0.561862	1.000000	
RLON	0.626778	-0.670446	-0.210185	-0.544966	1.000000

Source: *Author Computation (2025)*

As presented in Table 5 the correlation analysis reveals the nature of relationships between economic development (ED) and financial inclusion indicators, including Bank Branches (BBR), ATM Penetration (ATMP), Mobile Money Usage (MMU), and Rural Loans (RLON). Economic development is positively

associated with ATM penetration and rural loan disbursement, suggesting that greater access to ATMs and increased rural credit support improvements in real GDP per capita in Northern Nigerian states. In contrast, economic development shows negative associations with the number of bank branches and mobile money usage, indicating that higher branch density or mobile financial activity does not necessarily translate into higher economic output in some regions, possibly due to uneven distribution of financial services. Among the financial inclusion variables, bank branches are positively related to ATM penetration but negatively related to rural loans, while ATM penetration is negatively associated with mobile money usage and slightly negatively related to rural loans. Mobile money usage and rural loans also show a negative relationship, reflecting that increased mobile financial activity may not coincide with higher rural credit provision in certain states.

Table 6: Unit Root Test

	PP		ADF		
Variables	**Levels**	**First difference**	**Levels**	**First difference**	**I(d)**
ED	-0.9005	-26.8713***	-0.1049	-6.9397***	I(1)
BBR	-2.1290**		-1.7235*		I(0)
ATMP	-2.4977**		-0.9812	-9.6951***	I(0)
MMU	-2.8613***		-0.9492	-9.3005***	I(0)
RLON	-1.1553	-20.2429***	-0.9038	-11.1680***	I(1)

****,**,*, signify significance level at 1%, 5% and 10% respectively.*

Source: *Author Computation (2025)*

The unit root test results in Table 6, based on the Phillips–Perron (PP) and Augmented Dickey–Fuller (ADF) tests, reveal mixed orders of integration among the variables. Economic Development (ED), measured by real GDP per capita, is non-stationary at level but becomes stationary after first differencing under both PP and ADF tests, indicating that ED is integrated of order one, I(1). Bank Branches (BBR), proxied by the number of commercial bank branches per 100,000 adults, is stationary at level under both tests and is therefore integrated of order zero, I(0). ATM Penetration (ATMP) and Mobile Money Usage (MMU) are found to be stationary at level under the PP test but attain stationarity at first difference under the ADF test, implying that they are either I(0) or I(1) but not integrated beyond order one. Rural Loans (RLON), representing total rural credit disbursed, is non-stationary at level and becomes stationary after first differencing under both PP and ADF tests, confirming it as I(1), the coexistence of I(0) variables (BBR, ATMP, and MMU under PP) and I(1) variables (ED and RLON under both tests, and ATMP and MMU under ADF) confirms that none of the series is integrated of order two, thereby justifying and confirming the appropriateness of the Autoregressive Distributed Lag (ARDL) modelling approach for examining both short-run and long-run relationships in the study.

Table 7: Bound Test

Critical value bounds			**Test statistic**	**Value**	**k**
Significance	I0 Bound	I1 Bound			
10%	2.2	3.09			
5%	2.56	3.49	F-statistic	9.735600	4
1%	3.29	4.37			

Source: *Author Computation (2025)*

Table 7 reports the results of the ARDL bounds test for cointegration examining the relationship between financial inclusion and economic development in Northern Nigeria. The computed F-statistic of 9.7356 with k = 4 regressors is greater than the upper bound (I1) critical values at the 10%, 5%, and 1% significance levels, where the respective upper bounds are 3.09, 3.49, and 4.37. Based on the decision rule proposed by Pesaran, Shin, and Smith (2001), when the calculated F-statistic exceeds the upper bound critical value, the null hypothesis of no long-run relationship is rejected.

Table 8: ARDL Estimation

PANEL A: Long run ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BBR	6.159284	1243.639	0.004953	0.9961
ATMP	1202.992	1441.173	0.834731	0.4084
MMU	-2.992553	1.556678	-1.922397	0.0610*
RLON	0.001590	0.003677	0.432370	0.6676
C	415880.8	81282.40	5.116493	0.0000***

*EC = ED - (6.1593*BBR + 1202.9919*ATMP -2.9926*MMU + 0.0016*RLON + 415880.8443)*

PANEL B: Short run ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	456366.9	112998.8	4.038690	0.0002***
ED(-1)*	-1.097350	0.155844	-7.041318	0.0000***
BBR**	6.758891	1365.005	0.004952	0.9961
ATMP**	1320.103	1551.376	0.850924	0.3994
MMU(-1)	-3.283878	1.764506	-1.861075	0.0694*
RLON**	0.001745	0.003997	0.436475	0.6646
D(MMU)	-1.467006	1.187536	-1.235336	0.2233
CointEq(-1)*	-0.497350	0.136056	-8.065452	0.0000***

Source: *Author Computation (2025)*

As presented in Table 8 the long-run ARDL estimates in Panel A indicate that Bank Branches (BBR), ATM Penetration (ATMP), and Rural Loans (RLON) all exhibit positive coefficients, which are consistent with a priori expectations that improved access to formal financial services, electronic banking facilities, and rural credit should enhance economic development, measured by real GDP per capita, in Northern Nigeria. These positive signs align with the theoretical and empirical finance–growth literature, which emphasizes the role of financial depth and access in stimulating savings, investment, and productivity (Levine, 2005; Beck, Demirgüç-Kunt, & Levine, 2007). However, the coefficients of BBR, ATMP, and RLON are statistically insignificant, suggesting that despite expanded financial access, these channels have not been sufficiently strong to drive long-run economic development in the region. This outcome is consistent with evidence that financial access without effective usage, financial literacy, and complementary infrastructure may yield limited growth benefits (Allen et al., 2016). In contrast to these variables, Mobile Money Usage (MMU) carries a negative coefficient and is marginally significant at the 10 percent level, contradicting the expected positive relationship between digital financial services and economic development. This finding suggests that mobile money in Northern Nigeria may be predominantly used for consumption smoothing and low-

value transfers rather than productive investment, aligning with observations in low-income and fragile economies (Aker & Mbiti, 2010), but standing in contrast to studies that document strong positive growth and welfare effects of mobile money in more mature digital finance ecosystems (Suri & Jack, 2016). Overall, the long-run results imply that financial inclusion has not yet translated into meaningful economic development outcomes in Northern Nigeria, largely due to structural and institutional constraints.

The short-run ARDL results in Panel B reveal significant adjustment dynamics toward long-run equilibrium. The lagged dependent variable, ED(-1), is negative and statistically significant at the 1 percent level, confirming short-run corrections in real GDP per capita. Bank Branches (BBR), ATM Penetration (ATMP), and Rural Loans (RLON) all retain positive coefficients in the short run, in line with a priori expectations, but remain statistically insignificant, indicating that improvements in financial access do not exert immediate effects on economic development. Mobile Money Usage continues to display a negative influence, with MMU(-1) weakly significant at the 10 percent level and the short-run change in MMU remaining insignificant, reinforcing the evidence that digital financial services have not yet been effectively integrated into growth-enhancing activities. Most importantly, the error correction term, CointEq(-1), is negative and statistically significant at the 1 percent level, with a coefficient of approximately -0.50, implying that about 50 percent of any short-run disequilibrium between financial inclusion and economic development is corrected within one period. This indicates a relatively fast speed of adjustment and confirms the existence of a stable long-run relationship among the variables, consistent with the ARDL cointegration framework (Pesaran, Shin, & Smith, 2001; Narayan, 2005). Taken together, the short-run results reinforce the conclusion that while financial inclusion variables conform to theoretical expectations in sign, their immediate growth effects in Northern Nigeria remain limited, underscoring the need for policies that enhance the productive use of financial services.

Table 9: Post Estimation Test

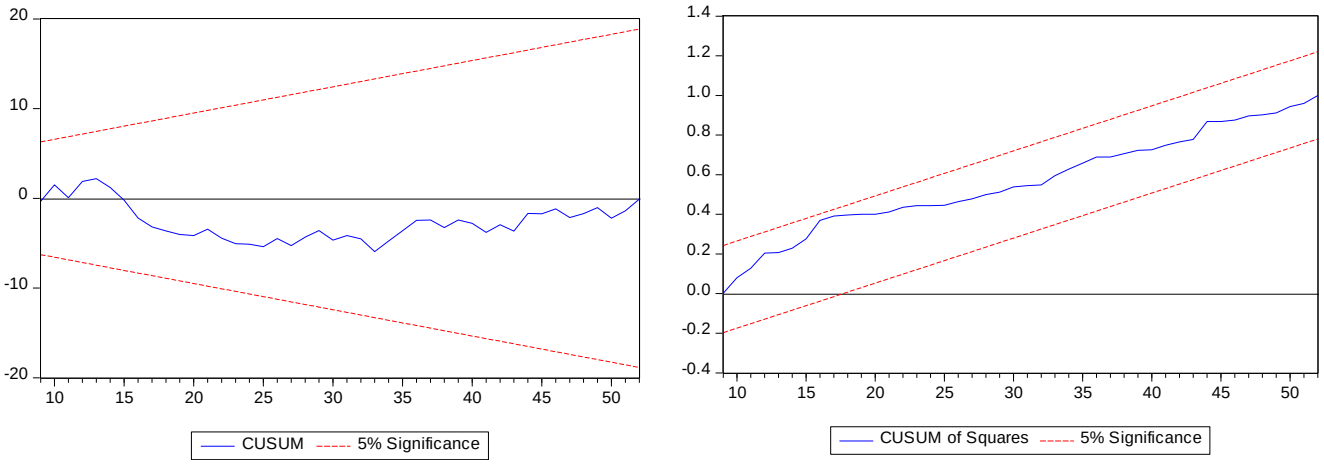
Post estimation test		
Test	**F-Stat**	**Prob**
Serial Correlation	0.042438	0.9585
Heteroscedasticity	0.76875	0.5985
	Jarque-Bera	
Normality	2.599907	0.272544

Source: *Author Computation (2025)*

Table 9 reports the post-estimation diagnostic tests used to evaluate the robustness and adequacy of the ARDL model examining the relationship between financial inclusion and economic development in Northern Nigeria. The serial correlation test produces an F-statistic of 0.042438 with a probability value of 0.9585, indicating that the null hypothesis of no serial correlation cannot be rejected, and thus the model residuals are free from autocorrelation. Similarly, the heteroscedasticity test yields an F-statistic of 0.76875 with a probability value of 0.5985, suggesting the absence of heteroscedasticity and confirming that the error variance is constant across observations. The Jarque–Bera normality test reports a statistic of 2.599907 with a probability of 0.272544, implying that the residuals are normally distributed. Taken together, these

results demonstrate that the estimated ARDL model satisfies the key classical regression assumptions and is econometrically sound, thereby validating the reliability of the estimated coefficients and supporting their use for meaningful inference and policy recommendations regarding financial inclusion and economic development in Northern Nigeria.

Figure 1**:** Cumulative Sum of Recursive Residuals of Cusum and Cusum of Square of ARDL



As illustrated in Figure 1, the model stability analysis indicates that the coefficients and relationships stay stable over time. This reliability indicates that the model is trustworthy and suitable for predicting outcomes and evaluating policies.

5.0 Conclusion and Recommendations

The study examined the relationship between financial inclusion and economic development in Northern Nigeria, focusing on states with high multidimensional poverty. Unit root tests revealed mixed orders of integration among the variables, justifying the use of the Autoregressive Distributed Lag (ARDL) approach, while the bounds test confirmed a stable long-run cointegrating relationship between financial inclusion and economic development. Long-run ARDL results indicate that Bank Branches, ATM Penetration, and Rural Loans have positive but statistically insignificant effects, suggesting limited impact of traditional financial inclusion channels on economic growth, whereas Mobile Money Usage exhibits a negative and marginally significant effect, implying that it is primarily used for consumption and low-value transfers rather than productive investment. Short-run results show significant adjustment dynamics, with approximately 50 percent of deviations from long-run equilibrium corrected within one period, indicating a relatively fast speed of adjustment and a stable long-run relationship. Post-estimation diagnostics confirm that the model is robust, with no evidence of serial correlation, heteroscedasticity, or non-normality. The findings suggest that financial inclusion in Northern Nigeria has not yet substantially contributed to economic development, highlighting structural and institutional constraints, limited productive use of financial services, and low financial literacy. Consequently, policy interventions should focus not only on expanding access to banking, ATMs, rural loans, and mobile money but also on enhancing their productive utilization, strengthening institutional frameworks, and improving financial literacy to achieve sustainable economic growth in the region. Based on the conclusion the following recommendations were made;

i. Policies should prioritize not only expanding access to banking infrastructure, ATMs, mobile money platforms, and rural credit but also ensuring that these financial services are used productively to stimulate economic growth. This can be achieved by promoting entrepreneurship programs, linking credit facilities to income-generating activities, and incentivizing investments in agriculture and small-scale enterprises.
ii. To maximize the benefits of financial inclusion, the government, financial institutions, and development partners should invest in financial literacy programs targeting low-income and rural populations. Education on effective savings, credit management, mobile money utilization, and investment strategies can empower households and small businesses to make informed financial decisions.
iii. Structural and institutional constraints currently limit the impact of financial inclusion on economic development in Northern Nigeria. Policymakers should focus on strengthening regulatory frameworks, improving transparency in credit allocation, and ensuring better monitoring and delivery of financial services, especially in rural and underserved areas.

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