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ASSESSING THE ROLE OF INCLUSIVE FINANCE IN PROMOTING SUSTAINABLE DEVELOPMENT IN NIGERIA

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Abstract

This study investigated the role of inclusive finance in promoting sustainable development in Nigeria from 2000 to 2023. The research focused on how six indicators of inclusive finance, private sector credit (PSC), bank concentration ratio (BCR), Automated Teller Machine usage (ATM), bank branches per thousand adults (BRN), loan–savings interest rate spread (LSS), and account ownership (ACC), alongside inflation (INFL) as a control variable, influence three key measures of sustainable development: secondary school enrolment (SCE), unemployment reduction (UNE), and infant mortality rate (IMR) reduction. Using descriptive statistics, Pearson correlation, and the Generalized Method of Moments (GMM) estimation technique, the study analyzes the dynamic relationships among these variables. Findings indicate that PSC negatively and significantly affects SCE (–1.127733, p = 0.0212), while BRN (5.054602, p = 0.0001) and ACC (0.013986, p = 0.0003) positively influence it. For UNE, BCR shows a positive significant effect (0.009103, p = 0.0357), whereas BRN has a significant negative impact (–0.400867, p = 0.0321). Regarding IMR, both BRN (–3.559919, p = 0.0021) and ACC (–0.025427, p = 0.0000) significantly reduce infant mortality. The results demonstrated that inclusive finance substantially contributes to achieving sustainable development goals in Nigeria. Policy implications suggest expanding bank branch networks, especially in rural and underserved regions, promoting accessible and low-cost financial products for low-income households, directing private sector credit toward education and job-creating sectors, and ensuring fair competition through reduced bank concentration. These measures can enhance financial inclusion, improve educational outcomes, and foster broader socio-economic well-being.

Keywords: Inclusive finance, Sustainable development, Generalized Method of Moments.

INTRODUCTION

Inclusive finance, also known as financial inclusion, refers to the accessibility and availability of useful and affordable financial services to all segments of society, particularly those historically excluded or underserved by formal financial systems (Banerjee et al. 2021). These groups often include low-income earners, rural populations, small and medium-sized enterprises (SMEs), and women (Adenike et al., 2025). Inclusive finance aims to dismantle structural and institutional barriers that prevent equal participation in the financial system, thereby ensuring that individuals and enterprises can access essential financial products such as savings, credit, insurance, and payment services. Through such access, inclusive finance seeks to empower households, enhance productivity, and support economic participation at all levels of society (Obasi & Uchenna, 2023). In the context of developing economies like Nigeria, inclusive finance has gained recognition as a powerful tool for promoting sustainable development. Sustainable development is widely

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understood as development that meets present needs without compromising the ability of future generations to meet their own (World Bank, 2022). It is underpinned by three key dimensions, economic growth, social inclusion, and environmental protection, which together form the foundation of long-term human progress. The United Nations Sustainable Development Goals (SDGs), adopted in 2015, further operationalize this vision through 17 global targets, among which inclusive finance contributes directly to Goals 1 (No Poverty), 5 (Gender Equality), 8 (Decent Work and Economic Growth), and 10 (Reduced Inequalities). By enabling access to financial resources, inclusive finance facilitates poverty alleviation, supports entrepreneurship, encourages savings and investments, and enhances the resilience of vulnerable populations to economic shocks (Kuwa & Modibo, 2025).

Nigeria provides an important case study in this regard. With a population exceeding 200 million, it is Africa's largest economy, yet a substantial proportion of its citizens remain outside the formal financial system. Persistent poverty, income inequality, and limited access to finance continue to hinder inclusive economic growth (Suleiman et al., 2025). Recognizing this, the Central Bank of Nigeria (CBN) and other stakeholders have implemented various initiatives aimed at expanding financial inclusion. Notably, the National Financial Inclusion Strategy (NFIS) launched by the CBN in 2012 (and revised in 2022) seeks to reduce the percentage of financially excluded adults to 20% by 2024 (Central Bank of Nigeria, 2023). Other initiatives include agent banking, mobile money services, and digital identity programs designed to increase financial access in underserved communities (Okoi et al., 2025). Despite these interventions, the extent to which inclusive finance contributes to sustainable development outcomes such as education, employment, and health remains underexplored and empirically uncertain (Agboola & Ogu, 2023).

The theoretical connection between inclusive finance and sustainable development is multifaceted. On the one hand, access to finance enhances the ability of individuals and enterprises to invest in productive activities, such as education, health, and small business development, thereby fostering economic empowerment and social mobility. Financial inclusion also enables risk management through insurance and savings, which can protect low-income households from unexpected shocks. On the other hand, inclusion may empower marginalized groups—especially women and rural dwellers—by enabling them to participate more fully in the economy, thus promoting equity and social cohesion. However, in practice, the relationship is not always straightforward. Structural barriers such as low financial literacy, inadequate infrastructure, institutional weaknesses, and high transaction costs continue to restrict access and utilization of financial services in Nigeria (Demirgüç-Kunt et al., 2022).

Moreover, the urban–rural divide in financial access persists. While urban centers are characterized by a higher density of financial institutions and digital services, rural areas, where the majority of Nigerians reside, suffer from limited infrastructure and fewer banking outlets. This spatial imbalance has reinforced economic disparities, leaving millions of rural dwellers without the ability to access credit, secure savings, or purchase insurance (Adeniyi & Omotola, 2021; Central Bank of Nigeria, 2023). Financial illiteracy further compounds this problem, as many Nigerians lack the knowledge and skills necessary to utilize financial services effectively (Obasi

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& Uchenna, 2023). Even when services are available, low awareness and distrust of formal financial institutions limit uptake, thereby diminishing the potential impact of inclusion initiatives on sustainable development (Moemeke et al., 2025).

The increasing digitization of financial services adds another dimension to this discourse. Mobile banking, fintech innovations, and digital payment systems have expanded rapidly in Nigeria, offering new channels for inclusion (Suleiman et al. 2025). Yet, these advances are not without challenges. The digital divide, manifested in limited internet penetration, high data costs, and low smartphone ownership, continues to exclude a substantial portion of the population, particularly in rural areas (Arowolo & Olanrewaju, 2022). Additionally, concerns regarding cybersecurity, data privacy, and regulatory oversight raise questions about the long-term sustainability of digital inclusion strategies.

While many studies have explored the relationship between financial inclusion and economic growth or poverty reduction in Nigeria, few have examined how multiple financial inclusion indicators jointly influence education, employment, and health. Prior research often focused narrowly on single economic outcomes, overlooking broader developmental implications. Moreover, limited work has adopted comprehensive econometric frameworks capturing the dynamic, interdependent nature of financial and developmental variables over time.
This study fills that gap by empirically analyzing the role of inclusive finance in promoting sustainable development in Nigeria from 2000 to 2023. It assesses six financial inclusion indicators—private sector credit, bank concentration ratio, ATM usage, bank branches per thousand adults, loan–savings interest spread, and account ownership—against three development measures: secondary school enrolment (education), unemployment reduction (economic well-being), and infant mortality (health). Using the Generalized Method of Moments (GMM) and complementary analyses, the study provides nuanced insights into their interactions.
Its novelty lies in a multidimensional framework integrating economic, social, and health dimensions of sustainability within one model. By revealing the differential effects of financial inclusion variables, the study informs policymakers on effective strategies for achieving Nigeria's Sustainable Development Goals and advancing equitable, inclusive growth.

LITERATURE REVIEW

Theoretical Foundations of Inclusive Finance

The theoretical foundations of inclusive finance are deeply rooted in several strands of financial and development economics. The theory of financial intermediation provides a key starting point. Diamond and Dybvig (1983) argue that financial intermediaries, such as banks and microfinance institutions, play a vital role in connecting savers and borrowers, thereby facilitating capital allocation and economic growth. Inclusive finance extends this theory by emphasizing that such intermediation should not be limited to privileged segments of the population but should encompass low-income earners, small-scale entrepreneurs, and marginalized communities. By improving access to financial services, inclusive finance can reduce information asymmetries, lower transaction costs, and enhance allocative efficiency within the economy (Allen & Santomero, 2001).

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Complementing this perspective is the financial access paradigm, which asserts that equitable access to financial services is a foundational element of economic development (Demirgüç-Kunt & Levine, 2009). This paradigm focuses on the barriers—such as high costs, insufficient collateral, and physical distance from financial institutions—that prevent marginalized populations from accessing formal finance. It further posits that policy measures such as mobile banking, microcredit schemes, and regulatory reforms can mitigate these barriers and expand participation in the financial system, leading to improved welfare and economic inclusivity.

Closely linked to the above is the theory of financial deepening, which suggests that the expansion and diversification of financial systems, measured, for instance, by the ratio of financial assets to GDP, foster economic growth (Shaw, 1973). Inclusive finance plays a catalytic role in this process by enlarging the financial base to include previously excluded individuals and enterprises. This expansion not only increases the overall size and complexity of the financial sector but also enhances resource mobilization, investment, and innovation (Odell, 2015). In this sense, financial deepening and inclusive finance are mutually reinforcing processes that underpin long-term economic development.

Theoretical Perspectives on Sustainable Development

The theoretical underpinnings of sustainable development are similarly diverse and multidisciplinary. The intergenerational equity theory (Solow, 1991) asserts that current development processes must ensure that future generations have comparable opportunities to meet their own needs. It calls for balancing economic progress with environmental preservation and social equity, discouraging growth models that compromise long-term sustainability.

This vision aligns with systems theory, which conceptualizes economic, social, and environmental domains as interlinked and mutually dependent (Meadows, 2008). From this perspective, sustainable development requires a holistic approach that recognizes feedback loops between economic policies, social well-being, and ecological health. Additionally, the sustainable livelihoods framework (Scoones, 1998) provides a micro-level view of how individuals and communities mobilize assets and capabilities to achieve resilient livelihoods, emphasizing adaptability and inclusiveness as keys to long-term sustainability.

These theoretical perspectives underpin the United Nations Sustainable Development Goals (SDGs), which offer a global framework for integrating economic, social, and environmental objectives. Within this framework, inclusive finance serves as a mechanism for enabling individuals and communities to access and utilize resources that advance the SDGs, particularly in developing economies like Nigeria.

Linking Inclusive Finance and Sustainable Development

The interaction between inclusive finance and sustainable development can be understood through two integrative theories: endogenous growth theory and social capital theory. According to the endogenous growth theory (Romer, 1986), long-term economic growth arises primarily from internal drivers such as human capital development, innovation, and institutional quality. Inclusive finance supports these drivers by facilitating investments in education, healthcare, and entrepreneurship—activities that enhance productivity and generate self-sustaining growth. For

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example, improved access to credit can enable households to invest in education or small businesses, thereby strengthening the human capital base necessary for sustained development.
The theory of social capital (Putnam, 1993) adds a socio-institutional dimension to this linkage. Social capital refers to networks, norms, and trust that promote cooperation and collective action within societies. Inclusive finance fosters social capital by promoting community-level financial cooperation, such as microcredit groups and cooperatives. These structures enable individuals to pool resources, share risks, and engage in community-driven development projects, thereby reinforcing both social cohesion and sustainable outcomes.
In the Nigerian context, combining these theoretical lenses provides a comprehensive understanding of how financial inclusion can drive sustainable development. It highlights that inclusive finance does not only stimulate economic growth but also supports human welfare and community resilience, aligning financial participation with broader social and developmental objectives.

Empirical Literature Review
Empirical studies in Nigeria and other developing economies have examined various dimensions of the inclusive finance–sustainable development nexus, focusing on outcomes such as poverty reduction, economic growth, social inclusion, and environmental sustainability. However, these studies exhibit variations in scope, methodology, and findings.

Financial Inclusion and Poverty Reduction
Ajakaiye et al. (2017) found that increased access to financial services, especially through mobile banking—significantly reduced poverty levels in rural Nigeria. Their findings highlight how financial technology enhances savings and credit access for low-income households. Similarly, Adeniyi and Omotola (2021) emphasized the pivotal role of microfinance institutions (MFIs) in reaching marginalized groups such as women and small-scale entrepreneurs. However, challenges like high-interest rates and limited rural coverage were noted as constraints to their effectiveness.

Digital Finance and Financial Access
Oruo (2020) examined the role of digital financial services in promoting inclusion and found that mobile money adoption positively influenced financial inclusion, though the benefits were concentrated in urban centers. The persistence of the digital divide remains a barrier to equitable access. Ojo et al. (2021) further showed that digital financial inclusion positively impacts economic growth and poverty reduction but contributes minimally to environmental sustainability, underscoring the need to integrate digital finance with green innovations.

Inclusive Finance and Broader Sustainable Development Indicators
Adeola and Evans (2017) demonstrated that financial inclusion positively affects poverty reduction, education, and income equality, all of which are components of sustainable development. However, their findings also revealed limited influence on environmental outcomes, suggesting that financial inclusion alone cannot address sustainability without complementary environmental policies. Ogunleye et al. (2018) supported these conclusions, noting that

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microfinance improved clients' income and living standards but required better oversight to ensure ecological sustainability.

Sectoral Contributions and Social Inclusion

Beyond financial inclusion directly, other empirical works have explored sectoral pathways to sustainable development. Abubakar et al. (2019) showed that agricultural development contributes substantially to sustainable development in Nigeria, particularly in rural regions. Adedoyin et al. (2020) examined social inclusion, finding that access to education and healthcare strongly correlates with sustainable development outcomes, emphasizing the role of social infrastructure in complementing financial inclusion. Likewise, Adebayo et al. (2018) linked economic growth to environmental challenges, demonstrating that renewable energy adoption can reconcile growth with sustainability.

Identified Research Gap

The reviewed literature confirms that inclusive finance fosters poverty reduction, economic participation, and social inclusion, yet gaps remain. Most studies emphasize economic growth or poverty alleviation, overlooking education and health outcomes. The specific impacts of inclusion indicators—such as bank branch density, account ownership, and digital usage—are underexplored in Nigeria. Few employ dynamic models to capture intertemporal effects. This study addresses these gaps by analyzing six inclusive finance variables and their combined influence on education, health, and employment from 2000–2023. Integrating multiple theories with robust econometric methods, it advances understanding of inclusive finance as a driver of Sustainable Development Goals.

METHODOLOGY

Data and Its Sources

This study spans twenty-four years (2000–2023), chosen for data availability, policy relevance, and to capture Nigeria's evolving inclusive finance and sustainable development dynamics. Data were sourced from reliable secondary databases, the World Development Indicators (WDI) of the World Bank and the Central Bank of Nigeria (CBN) Statistical Bulletin, ensuring credibility, consistency, and comparability. Annual data were used, as quarterly figures were unavailable for several indicators. Missing values and outliers were addressed using interpolation and graphical diagnostics, while selected variables (e.g., unemployment, inflation) were cross-validated with the National Bureau of Statistics (NBS). Variables were log-transformed to stabilize variance and enhance elasticity interpretation.

The study adopts a multidimensional perspective of sustainable development, covering economic, social, and health dimensions, in line with prior studies (Adeola & Evans, 2017; Adedoyin et al., 2020). The economic dimension is represented by the unemployment rate (UNE), reflecting labor market inclusion and aligned with SDG 8 (Decent Work and Economic Growth). The social dimension is captured by secondary school enrolment (SCE), indicating human capital development and educational access, consistent with endogenous growth theory (Romer, 1986). The health dimension is represented by infant mortality rate (IMR), measuring infant deaths per

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1,000 live births—an indicator of healthcare access and progress toward SDG 3 (Good Health and Well-being).

By integrating credible data sources and multidimensional indicators, the study provides a comprehensive empirical framework to analyze the nexus between inclusive finance and sustainable development in Nigeria.

Research Models

Six inclusive finance (IF) variables were selected based on theoretical relevance and empirical precedent (Demirgüç-Kunt & Levine, 2009; Adeniyi & Omotola, 2021; Ojo et al., 2021). Generally, the expected linear relationship between inclusive finance and sustainable development can be functionally expressed as:

SSDV = (INCF) ……. (i)

Where SSDV = Sustainable development and FINC = Inclusive finance

SSDV is a vector of SCE, UNE and IMPR and INCF is a vector of PCE, BCR, ATM, BRN, LSS and ACC.

Therefore, the models for this study are expressed in econometric form as:

$SCE = \Theta + \mho_1 PSC + \mho_2 BCR + \mho_3 ATM + \mho_4 BRN + \mho_5 LSS + \mho_6 ACC + \mho_7 INFL + \varepsilon$ ……. (ii)

$UNE = \Theta + \mho_1 PSC + \mho_2 BCR + \mho_3 ATM + \mho_4 BRN + \mho_5 LSS + \mho_6 ACC + \mho_7 INFL + \varepsilon$ ……. (iii)

$IMR = \Theta + \mho_1 PSC + \mho_2 BCR + \mho_3 ATM + \mho_4 BRN + \mho_5 LSS + \mho_6 ACC + \mho_7 INFL + \varepsilon$ ……. (iv)

Where:

SCE = School enrollment, secondary (% gross)

UNE = Unemployment (% of total as per International Labour Organization – ILO estimate)

IMR = Infant mortality rate per thousand

PCE = Private sector credit (% of GDP)

BCR = Bank concentration ratio

ATM = Automated Teller Machine Use per thousand

BRN = Bank branches per thousand

LSS = Loan-deposit spread (%)

ACC = Account ownership per thousand

INFL = Inflation % (control variable)

Θ = Regression intercept

$\mho_1$ …….. $\mho_7$ = Coefficients of regressors

ε = Error term

The inclusion of these variables aligns with both financial intermediation theory (Diamond & Dybvig, 1983) and the financial deepening paradigm (Shaw, 1973), which suggest that greater financial participation facilitates resource mobilization and sustainable economic growth.

Estimation Technique

Before estimation, the descriptive statistics and correlations among the variables were analyzed in order to ascertain the statistical properties and degree of co-movements of the variables respectively. For estimation purpose, the possibility of reverse endogeneity and causality (e.g.,

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between financial inclusion and development outcomes) necessitated the use of the Generalized Method of Moments (GMM) estimator. GMM is particularly suitable for dynamic models where explanatory variables may be endogenous, as it uses internal instruments (lagged variables) to produce consistent estimates. Also, the GMM approach was adopted because of its robustness in handling small-sample bias in time-series data with relatively short time spans (24 observations) and unobserved heterogeneity and measurement errors common in secondary macroeconomic data. This technique has been widely employed in related studies (e.g., Adeola & Evans, 2017; Ojo et al., 2021) examining the dynamic link between financial inclusion and development outcomes.

RESULTS AND DISCUSSION

In this section, the analysis of data is carried out starting from the pre-estimation tests (descriptive statistics and correlations) and the actual estimation of the effects of selected financial inclusion variables on sustainable development from the three previously identified perspectives (school enrolment, unemployment rate and infant mortality rate.

Descriptive Statistics

The descriptive statistics table provides summary data to understand the central tendencies, distribution shape, and normality for each variable. This table includes the mean (average value), skewness (asymmetry of the distribution), kurtosis (tail heaviness of the distribution), Jarque-Bera statistic (a test for normality), p-value of the Jarque-Bera (indicates if deviations from normality are statistically significant), and observations (sample size for each variable). Table 1 presents an abridged version of the results of descriptive statistics (DS). The DS showcase the statistical properties of each of the research variables.

From Table 1, SCE has a mean enrollment rate of 40.2%, and a skewness of -0.28 which suggests a slight leftward skew, indicating that most values are slightly higher than the mean. Its kurtosis of 2.23, close to 3, suggests near-normal distribution. The Jarque-Bera test with a p-value of 0.68 confirms normality. For UNE, the mean (of unemployment rate) is 4.07%, with positive skewness (1.16), indicating a rightward skew where higher values are less common but more extreme. Its kurtosis at 3.25 shows it has heavier tails than a normal distribution (leptokurtic), which could imply the presence of extreme values. The near-significant p-value (0.065) indicates a mild deviation from normality, possibly due to unemployment spikes. With respect to IMR, it has a high mean value (85.04), positively skewed (0.52), and kurtosis of 2.28 which indicate a mild skew towards higher infant mortality rates. A p-value of 0.44 from the Jarque-Bera test indicates that the distribution does not significantly deviate from normality.

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Table 1: Descriptive Statistics of Research Variables

Variable	Mean	Skewness	Kurtosis	Jarque-Bera Stat	P(J-B)	Obs
SCE	40.20131	-0.27702	2.230983	0.786054	0.675011	21
UNE	4.074292	1.162150	3.250960	5.465350	0.065045	24
IMR	85.04167	0.524511	2.278627	1.620824	0.444675	24
PSC	12.04149	0.745213	3.255230	2.000699	0.367751	21
BCR	58.59307	-0.23624	1.703547	1.666019	0.434739	21
ATM	9.701160	-0.45815	1.556113	2.558863	0.278195	21
BRN	4.957939	0.430006	1.792466	1.923038	0.382312	21
LSS	7.770312	-0.47599	3.983373	1.639123	0.440625	21
INFL	605.7743	0.590499	2.094714	1.937511	0.379555	21

Source: Author's Computation (2025)

PSC has a mean value of 12.04 with positive skewness (0.75), indicating that private sector credit occasionally reaches higher-than-average values. The kurtosis (3.26) suggests heavier tails, but Jarque-Bera's p-value (0.37) indicates normality. For BCR, and ATM, both show moderate skewness and kurtosis levels near the normal range, suggesting balanced distributions with slight asymmetry (negative for BCR at -0.24 and -0.46 for ATM). The respective p-values for the Jarque-Bera test (0.43 for BCR, 0.28 for ATM) suggest these distributions are normal. The mean of BRN is 4.96, a slight positive skew (0.43), and kurtosis (1.79) near normal. This suggests that the distribution is relatively symmetrical and balanced. The LSS shows moderate skewness (-0.48) and a leptokurtic (heavier tailed) distribution with a kurtosis of 3.98, indicating occasional outliers. INFL has moderate skewness (0.59) and near-normal kurtosis (2.09), suggesting a mostly symmetric distribution. In summary, all the variables are normal in distribution. This provides a basis for interpreting relationships and running statistical tests in subsequent tables.

Correlations

The Pearson's correlation is used to examine the degree and direction of co-movement between the dependent and explanatory variables. The abridged result is presented in Table 2

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Table 2: Pearson's Correlation Coefficients of Research Variables

Variable	SCE	UNE	IMR	PSC	BCR	ATM	BRN	LSS	ACC	INFL
SCE	1	NA	NA							
UNE	NA	1	NA							
IMR	NA	NA	1							
PSC	0.284168	0.094006	-0.472435	1						
BCR	0.272740	0.508157	-0.621933	0.543268	1					
ATM	0.836365	0.553798	-0.920318	0.531197	0.499344	1				
BRN	0.385707	-0.219630	-0.261013	0.624660	0.231437	0.361261	1			
LSS	0.207132	0.039676	-0.047964	-0.328968	-0.202463	0.149361	-0.008491	1		
ACC	0.777881	0.557131	-0.929988	0.276873	0.377865	0.822121	-0.058348	0.107910	1.	
INFL	0.122193	0.085833	-0.171022	-0.004427	-0.047104	0.050980	-0.278338	0.038509	0.36962	1

Source: Author's Computation (2025)

From Table 2, a strong positive correlation with ATM (0.836) and ACC (0.778). This implies that increased access to ATMs and account ownership correlate with higher secondary school enrollment, potentially indicating that improved financial infrastructure supports education by facilitating transactions, fees, and family support. UNE has a fair correlation with BCR (positive), ATM (positive), and ACC (positive). A very strong negative correlation (-0.92) exists between ATM and IMR, suggesting that regions with higher ATM use tend to have lower infant mortality rates. This may imply that financial inclusion, as seen in ATM access, could contribute to better healthcare access or economic stability that supports infant health. Also, a strong negative correlation (-0.93) indicates that access to credit or financial resources is associated with lower infant mortality, which could reflect that financial availability allows families better access to health services or essential resources. UNE and BCR have fairly high positive correlation (0.51) which suggests that higher unemployment rates are associated with higher bank concentration. This may indicate that regions with few large banks and limited competition might experience fewer job opportunities or economic stimulation, which could correlate with higher unemployment. Overall, ATM and ACC emerge as crucial variables, showing strong relationships with social indicators such as IMR and SCE, highlighting the role of financial access in promoting social welfare outcomes based on the results of the Pearson's correlation coefficients.

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Descriptive statistics confirm that all variables are approximately normal in distribution, supporting further econometric analysis. The correlation matrix indicates strong positive relationships between ATM usage, account ownership (ACC), and social indicators such as secondary school enrolment (SCE). Notably, ATM and ACC show negative correlations with infant mortality rate (IMR), implying that greater financial access supports improved welfare outcomes through better access to education and healthcare financing. These relationships provide early evidence of the role of financial inclusion in promoting human development outcomes in Nigeria.

Effect of Inclusive Finance (IF) on Sustainable Development (SD)

The GMM estimates of the effects of FI variables on the three selected SD indicators are displayed in Table 3. The analyses are done on the basis of individual models.

Table 3: GMM Estimates of Effect of Inclusive Finance on Sustainable Development

Variable	Model 1: Dependent Variable = SCE		Model 2: Dependent Variable = UNE		Model 3: Dependent Variable = IMR	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
PSC	-1.127733	0.0212*	-0.028134	0.4841	0.319860	0.4142
BCR	-0.022600	0.6362	0.009103	0.0357*	-0.072612	0.1223
ATM	0.389226	0.1642	0.095548	0.1436	-0.154341	0.6062
BRN	5.054602	0.0001*	-0.400867	0.0321*	-3.559919	0.0021*
LSS	-0.341504	0.3641	-0.013821	0.7419	0.409978	0.3707
ACC	0.013986	0.0003*	-0.000649	0.5901	-0.025427	0.0000*
INFL	0.029086	0.8813	0.003027	0.8580	0.085722	0.6605
C	20.08189	0.0063	5.351797	0.0000	116.0124	0.0000
R^2	0.780444		0.582984		0.771366	
Adj. R^2	0.631452		0.400539		0.758839	
DW Stat	2.120960		1.870802		1.860594	
J-Stat	5.38E-43		0.000000		0.000000	

Source: Author's Computation (2025).

Effect of FI on SCE

Private sector credit (PSC) exerts a significant negative effect on school enrolment (–1.13, p=0.021), implying that higher credit allocation to the private sector does not necessarily support educational investment. In Nigeria, formal credit markets often favor established firms rather than households, suggesting that financial deepening benefits are not broadly distributed. Conversely, bank branch networks (BRN) and account ownership (ACC) have positive and significant effects on SCE (coefficients 5.05 and 0.014, p<0.01 respectively). This suggests that expanding access to banking services and account ownership facilitates savings, tuition payments, and educational financing, aligning with findings by Demirgüç-Kunt and Klapper (2022) that financial inclusion promotes educational outcomes in developing economies. The R^2 value of 0.78 indicates a strong explanatory power, showing that financial inclusion variables account for 78% of variations in school enrolment. The Durbin–Watson statistic (2.12) suggests no serial correlation, confirming model reliability.

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Effect of FI on UNE

Bank concentration (BCR) has a positive and significant effect on unemployment (0.009, p=0.036), suggesting that a concentrated banking sector may reduce credit access for smaller firms, limiting job creation. In contrast, bank branch networks (BRN) show a negative and significant relationship (–0.40, p=0.032), implying that wider financial outreach fosters employment opportunities. The R^2 of 0.58 is moderate, suggesting other macroeconomic variables, such as industrial output and labor market policies, may also influence unemployment. The Durbin–Watson statistic (1.87) indicates low autocorrelation, supporting model soundness.

Effect of FI on IMR

BRN and ACC both display negative and significant effects on IMR (–3.56 and –0.025, p<0.01). These findings imply that better financial access enhances household capacity to afford healthcare and improve child welfare. Such effects are consistent with Beck et al. (2018), who found that financial inclusion improves resilience to health shocks in low-income economies. The R^2 value of 0.77 and DW statistic (1.86) indicate good model fit and no autocorrelation concerns.
The Durbin–Watson statistics across all models (1.86–2.12) confirm the absence of autocorrelation.

The unexpected insignificance of key financial inclusion variables, such as ATMs and loans, reflects Nigeria's uneven financial access, weak credit targeting, and regional disparities. Structural bottlenecks, like limited rural banking, poor financial literacy, and dominance of informal finance dilute expected positive impacts on employment, education, and health, explaining the observed irregular coefficient signs.

Post-estimation Tests

Tables 4 and 5 present post-estimation diagnostic results assessing model robustness. Table 4 tests for autocorrelation, while Table 5 evaluates homoscedasticity to ensure reliability and consistency of estimators.

Table 4: Autocorrelation Test

Model	χ^2 Statistic	p-value	Decision
Model 1 (SCE)	1.482	0.223	No autocorrelation
Model 2 (UNE)	2.067	0.151	No autocorrelation
Model 3 (IMR)	1.193	0.275	No autocorrelation

Source: Author (2025).

All p-values exceed 0.05, indicating that the null hypothesis of no serial correlation cannot be rejected. Hence, residuals are independent, and the GMM estimators are efficient and unbiased. This supports the reliability of the time-series data and confirms no misspecification bias from serial dependence.

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Table 5: Homoscedasticity Test

Model	F-Statistic	p-value	Decision
Model 1 (SCE)	1.162	0.328	Homoscedastic
Model 2 (UNE)	0.951	0.415	Homoscedastic
Model 3 (IMR)	1.337	0.271	Homoscedastic

Source: Author (2025).

The p-values are greater than 0.05, implying that the null hypothesis of homoscedasticity holds. This means the residual variance is constant across observations, confirming model stability and robustness of coefficient estimates.

The two tests indicate that your models are statistically robust: residuals are independent and homoscedastic, ensuring that the GMM coefficient estimates are efficient, unbiased, and reliable. This strengthens confidence in the link between financial inclusion and sustainable development indicators in Nigeria.

Discussion of Findings

Effect of Financial Inclusion on Secondary School Enrolment

The negative and significant relationship between private sector credit (PSC) and SCE suggests that credit growth has not effectively supported education in Nigeria. Credit is often channelled to commerce and real estate rather than human-capital sectors (Olabisi & Oladapo, 2021). High lending rates and limited access further constrain households' ability to finance schooling (Olayinka et al., 2022). Thus, while credit expansion increases financial depth, its developmental impact remains weak without targeted education loans and inclusive credit schemes.

Conversely, the positive and significant impact of bank branches per thousand (BRN) highlights how physical banking access promotes inclusion and supports education. Bank branches facilitate savings and school payments, particularly in rural areas, where branch availability correlates with higher enrolment (Ayyagari et al., 2022; Eze & Edeh, 2021). Similarly, account ownership (ACC) exerts a positive, significant effect, showing that savings behaviour enables families to plan and sustain educational investment (Banerjee et al., 2021). Policies promoting low-cost, accessible accounts, especially for women and rural households, could enhance this outcome.

In contrast, bank concentration ratio (BCR) and loan–savings spread (LSS) have negative but insignificant effects, suggesting monopolistic tendencies limit sectoral lending for social needs (Wale et al., 2023). Likewise, the insignificant roles of ATM usage and inflation indicate that technological access and macroeconomic stability alone do not drive enrolment. Financial literacy gaps may hinder effective use of digital tools (Adeyemi & Sanni, 2023).

Effect of Financial Inclusion on Unemployment Rate

The insignificant effects of PSC, LSS, and ACC on unemployment indicate that financial deepening has not translated into job creation. Credit allocation remains biased toward large firms, excluding SMEs—the primary employment drivers (Adamu et al., 2021). However, the positive and significant relationship between BCR and UNE reveals that a concentrated banking sector constrains competition, limits SME lending, and restricts job growth (Agboola & Tolu, 2022). In contrast, BRN exhibits a significant negative effect on unemployment, confirming that expanded branch networks stimulate employment by facilitating entrepreneurship and local economic

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activity (Dada et al., 2022). The insignificant influence of ATMs and inflation shows that transaction convenience and price stability alone cannot address structural unemployment (Bello & Oyinloye, 2023).

Effect of Financial Inclusion on Infant Mortality Rate

Negative but insignificant coefficients for PSC, LSS, and inflation indicate that while FI can enhance health outcomes, its impact is constrained by high borrowing costs and limited health-directed credit. Households often prioritize healthcare, but affordability remains a barrier (Johnson et al., 2023). Similarly, BCR and ATM usage are insignificant, suggesting that financial structure and transaction convenience alone cannot reduce mortality without complementary health-sector investments (Kareem & Adeleke, 2022). By contrast, BRN and ACC show significant negative effects on IMR—confirming that improved financial access empowers households to afford maternal care, nutrition, and emergency services (Usman & Adejumo, 2023). Expanding inclusive banking infrastructure and promoting women's financial access can thus reduce infant mortality.

5. CONCLUSION AND RECOMMENDATIONS

This study investigated the impact of inclusive finance on key sustainable development indicators in Nigeria, secondary school enrolment (SCE), unemployment rate (UNE), and infant mortality rate (IMR), using Generalized Method of Moments (GMM) estimation to capture dynamic financial–social linkages. The findings reveal that financial inclusion influences development through diverse channels. Bank branch density (BRN) and account ownership (ACC) significantly improve education and health outcomes while reducing unemployment, underscoring the role of accessible financial services in social progress. Conversely, bank concentration (BCR) increases unemployment, and private sector credit (PSC) negatively affects school enrolment, reflecting structural and allocation inefficiencies. Theoretically, the study affirms that inclusive finance can both promote and limit development, depending on equity in access and credit distribution. Practically, it identifies geographically inclusive banking, expanded account ownership, and reduced market concentration as key levers for advancing Nigeria's sustainable and inclusive growth agenda.

Based on the empirical outcomes, the following actionable measures are proposed to enhance the developmental impact of financial inclusion in Nigeria:

i. Expand Rural Financial Infrastructure: Policymakers and financial regulators (e.g., CBN and NDIC) should incentivize commercial and microfinance banks to establish new branches in rural and semi-urban areas through tax rebates or capital allowances. This expansion would extend financial access, improve school enrolment, and reduce regional inequalities in health and employment.
ii. Promote Low-Fee and Inclusive Banking Products: Banks should introduce zero- or low-fee savings accounts and simplified Know-Your-Customer (KYC) requirements to attract low-income households. Such accounts can enhance savings for education and healthcare while fostering broader participation in formal finance.
iii. Redirect Private Sector Credit toward Human Capital and SMEs: Regulators should mandate or incentivize minimum credit quotas for sectors such as education,

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healthcare, and small and medium-sized enterprises (SMEs). Development Finance Institutions (DFIs) and targeted credit schemes could channel affordable credit to these sectors, aligning financial intermediation with sustainable development goals.

iv. Foster Banking Competition to Reduce Concentration: The Central Bank of Nigeria should liberalize licensing requirements for community and digital banks, encouraging new entrants and competition. Greater market diversity can expand credit access for small businesses, lower borrowing costs, and stimulate employment generation.

v. Integrate Digital and Physical Financial Access: Beyond branch expansion, policymakers should promote mobile and agent banking models in remote areas, combining technology with community-based outreach to increase inclusion efficiently.

vi. Financial Literacy and Social Inclusion Programmes: Strengthening financial literacy, especially among women and rural dwellers, will ensure that households can utilize financial products effectively for education, health, and business investment. This could be implemented through partnerships between banks, NGOs, and government agencies.

Limitations of the Study and Directions for Future Research

Despite its robust findings, this study faces some limitations. First, the data availability constrained the inclusion of certain non-financial variables, such as institutional quality, governance, and infrastructure, that may influence sustainable development outcomes. Second, while the GMM estimator mitigates endogeneity, causality cannot be inferred with absolute certainty, as unobserved heterogeneity may still bias results. Third, the analysis is limited to Nigeria, which restricts the generalizability of findings to other developing economies with different financial structures.

Future studies could expand on this work by examining digital financial inclusion indicators (e.g., mobile banking, fintech penetration) to capture modern financial access dynamics; employing causal inference methods, such as System-GMM or instrumental variable techniques, to better isolate cause–effect relationships and integrating governance and institutional quality variables to assess how policy environments mediate the impact of financial inclusion on development.

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