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Research article

Micro, small and medium enterprises (MSME) financing and inclusive growth in Nigeria: an ARDL bounds testing approach

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Abstract
This study examines the effect of Micro, Small, and Medium Enterprise (MSME) development on inclusive growth using quarterly time-series data from 2010 to 2024, sourced from the Central Bank of Nigeria Statistical Bulletin, the National Bureau of Statistics (NBS), and the World Bank Global Findex. Inclusive growth is proxied by financial inclusion, operationalized as a composite index constructed from five indicators: account ownership, deposit money bank (DMB) branches, automated teller machines (ATMs), point-of-sale (POS) terminals, and mobile/digital registered accounts. The composite index was derived through Principal Component Analysis (PCA) to reduce dimensionality and address inter-indicator multicollinearity. The Autoregressive Distributed Lag (ARDL) bounds testing framework was employed to estimate long-run and short-run dynamics among financial inclusion, MSME credit, private sector credit, interest rate, and inflation. Empirical findings show that MSME credit significantly ($p < 0.05$) promotes inclusive growth, while private sector credit and inflation exhibit statistically weak effects. These results underscore that expanding targeted MSME financing and improving access to affordable financial services are essential to advancing equitable economic participation in Nigeria.

Keywords: Inclusive growth, financial inclusion index, MSME credit, inflation rate, interest rate, ARDL

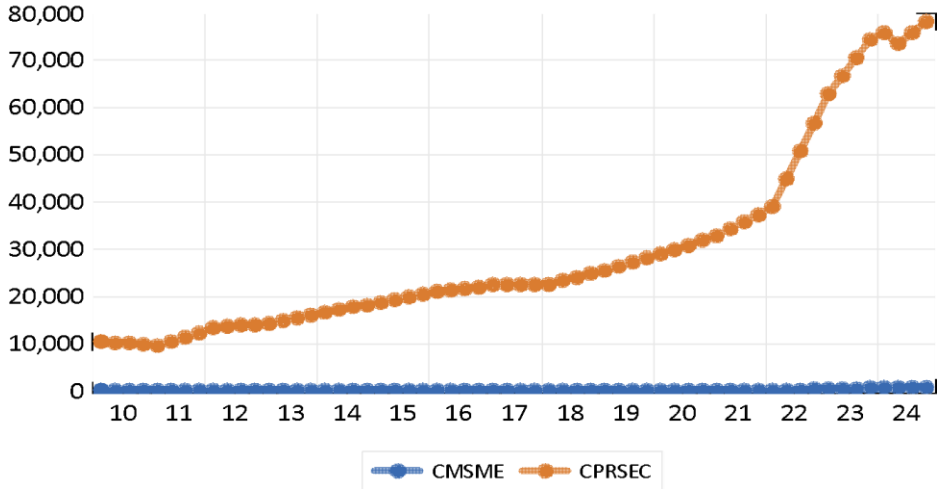
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INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) occupy a pivotal position in Nigeria's economic structure. The 2021 National Bureau of Statistics (NBS) survey estimated MSMEs' contribution to GDP at approximately 46.32%, with the sector accounting for roughly 96.9% of all businesses and about 84–88% of employment (NBS, 2022; PwC, 2024). Despite this centrality, MSMEs operate under considerable constraints: high inflation, deteriorating infrastructure, limited access to formal credit, and regulatory complexity (Abdul, Akinwolere & Salawu, 2025; Ezeoha et al., 2024).

Figure 1. Lending Volumes and Shares Between MSMEs And Entire Private Sector in Nigeria (2010 -2024)



Access to finance remains among the most binding constraints on MSME performance. The Central Bank of Nigeria (CBN) estimates that unmet credit demand is particularly acute in agriculture and retail (CBN, 2024), while deposit money banks (DMBs) concentrate lending toward medium-sized and large firms due to perceived risk, information asymmetry, and elevated macroeconomic pressures. Mammah and Ohazurike (2025) place the total MSME financing gap at approximately US $32.2 billion (NGN 13 trillion). Against this backdrop, the concept of inclusive growth where economic expansion is broadly shared across income groups, regions, and enterprise sizes has gained renewed policy relevance in Nigeria.

Inclusive growth in the Nigerian context is most practically proxied by financial inclusion, which captures the extent to which households and enterprises participate in formal financial systems (World Bank, 2022; Ozili, 2025). Expanding MSME credit can catalyse formalization, account uptake, and value-chain integration, but macroeconomic environment (particularly inflation and interest rates) mediates the transmission from credit supply to meaningful inclusion (Ozili, 2025; CBN, 2024). Despite a growing body of literature on MSME financing and financial inclusion separately, studies that jointly examine MSME credit dynamics and financial inclusion as a composite outcome within a rigorous time-series framework remain limited for Nigeria. This paper addresses that gap by estimating the long-run and short-run relationship between MSME credit, private sector credit, inflation, interest rates, and a PCA-derived financial inclusion index for Nigeria over 2010Q1–2024Q4, using the ARDL bounds testing approach.

LITERATURE REVIEW

Conceptual and Theoretical Framework

Financial inclusion serves as the primary proxy for inclusive growth in this study, reflecting whether households and micro enterprises can access and utilize formal financial services including account ownership, savings, credit, and digital payment instruments (World Bank, 2022). Targeted MSME credit promotes formalization and value-chain integration, while aggregate private sector credit signals broader financial depth. However, the inclusive dividend of credit expansion depends critically on whether lending actually reaches small firms rather than concentrating among large borrowers (PwC, 2024; CBN, 2024). Macroeconomic conditions modulate this relationship: high inflation erodes real savings and amplifies uncertainty, while elevated interest rates raise borrowing costs and dampen uptake of formal financial services. Ozili (2025) confirms that monetary and banking sector variables are significant determinants of financial inclusion in Nigeria, implying that MSME credit will translate into inclusive growth only within a sufficiently stable macroeconomic environment.

The theoretical underpinning of the study draws on four complementary strands. First, financial intermediation theory (Schumpeter, 1911) holds that financial institutions mobilize savings and channel credit into productive activities, facilitating economic participation. In the Nigerian context, CBN-targeted MSME credit programmes operationalize this mechanism. Second, credit rationing theory (Stiglitz & Weiss, 1981) explains why information asymmetry and collateral constraints restrict MSME access to formal credit, justifying policy interventions such as credit guarantee schemes and specialized lending windows (Ezeoha et al., 2024). Third, endogenous growth theory (Romer, 1990; Lucas, 1988) positions firm-level innovation, human capital, and productivity as internal drivers of long-run growth, suggesting that financial resources directed at MSMEs foster employment, innovation, and value-chain participation, which in turn deepen financial inclusion (Akinrinde, Adelakun, Okogor, & Jerome-Ukaoke, 2025). Fourth, monetary theory highlights that inflation and interest rate conditions constrain credit access and reduce households' real ability to participate in financial systems (Ozili, 2025; CBN, 2024). Together, these theories imply that targeted credit allocation and macroeconomic stability are jointly necessary for MSME development to produce sustainable inclusive growth.

RESEARCH METHOD AND MATERIALS

Research Design and Data

The study adopts an ex-post facto research design, appropriate where variables of interest have already occurred and the objective is to explain their relationships rather than to manipulate them experimentally (Creswell, 2014). Quarterly time-series data spanning 2010Q1 to 2024Q4 (60 observations) are drawn from the CBN Statistical Bulletin, the NBS, and the World Bank Global Findex. The quarterly frequency maximises observations, improving the power of statistical tests and the reliability of econometric estimates.

Variable Measurement and Construction

The dependent variable, inclusive growth, is proxied by a financial inclusion index (FII) constructed via Principal Component Analysis (PCA) from five indicators: account ownership rate, number of DMB branches, ATM count, POS terminal count, and mobile/digital registered accounts. PCA reduces dimensionality, weights indicators by explained variance, and eliminates redundancy, following the approach of Ozili (2025) and World Bank Findex studies (World Bank, 2022).

The explanatory variables are: (i) MSME credit (MSMECR) - total credit extended to MSMEs, log-transformed; (ii) private sector credit (PRVCR) - domestic credit to the private sector as a percentage of GDP, log-transformed; (iii) inflation (INFL) - annual percentage change in the Consumer Price Index; and (iv) lending interest rate (INTR) - average bank lending rate, capturing the cost of credit. Log transformation of credit variables normalizes their distributions and stabilises variance.

Model Specification and Estimation

The baseline relationship is specified as:

$$FII_t = f(MSMECR_t, PRVCR_t, INFL_t, INTR_t) + \varepsilon_t \quad \ldots\ldots(1)$$

The ARDL framework of Pesaran, Shin, and Smith (2001) is adopted because it accommodates variables integrated of different orders [I(0) or I(1)] which is typical of macroeconomic data; it simultaneously estimates long-run equilibrium and short-run dynamics; and it performs reliably in small samples. The general ARDL (p, q_1, q_2, q_3, q_4) specification is:

$$\Delta FII_t = \alpha_0 + \Sigma\alpha i \Delta FII_{t-i} + \Sigma\beta j \Delta MSMECR_{t-j} + \Sigma\gamma k \Delta PRVCR_{t-k} + \Sigma\delta l \Delta INFL_{t-l} + \Sigma\vartheta m \Delta INTR_{t-m} + \lambda(ECT_{t-1}) + \mu_t \quad \ldots\ldots(2)$$

where Δ denotes the first-difference operator, ECT is the error correction term, and λ is the speed of adjustment coefficient, expected to be negative and statistically significant if long-run cointegration holds.

Estimation proceeds in four steps: (i) descriptive statistics and correlation analysis; (ii) ADF unit root tests to confirm that no variable is I(2); (iii) ARDL bounds test for cointegration; and (iv) estimation of long-run coefficients and the short-run error correction model (ECM). Post-estimation diagnostics include the Harvey heteroskedasticity test, Ramsey RESET specification test, Jarque-Bera normality test, and the CUSUM test for parameter stability.

RESULT PRESENTATION AND DISCUSSION

Descriptive Statistics and Correlation

The financial inclusion index (FII) averages 0.285, reflecting moderate and uneven access to formal financial services across the sample period. MSME credit and private sector credit display high variability, consistent with episodic credit cycles in Nigeria. Inflation and interest rates average 15.49% and 16.84% respectively, reflecting persistently elevated monetary conditions (see Table 1). Correlation analysis indicates that FII is most strongly associated with private sector credit (r = 0.880) and MSME credit (r = 0.734), followed by inflation (r = 0.778). The correlation between FII and interest rate is relatively weak (r = 0.220), suggesting that the direct cost-of-credit effect on financial inclusion is secondary to credit availability in the short run (see Table 2).

Table 1. Descriptive Statistics

Statistic	FII	LNMSMECR	LNPRVCR	INFL	INTR
Mean	0.2851	9.4762	10.1348	15.49	16.84
Median	0.2463	9.3215	10.0874	14.28	17.25
Maximum	1.000	11.8934	11.7421	28.92	27.18
Minimum	-0.431	7.1053	8.4162	7.74	8.6
Std. Dev.	0.3614	1.2047	0.8631	5.381	4.2963
Skewness	0.5821	0.3214	0.1872	0.874	-0.432
Kurtosis	2.8431	2.1053	2.3641	2.781	2.4312
Jarque-Bera	4.2134	2.8431	1.9742	9.431	3.1842
Probability	0.1214	0.2413	0.3724	0.009	0.2034
Observations	60	60	60	60	60

Note: *FII = Financial Inclusion Index (PCA composite). LNMSMECR = log of MSME credit. LNPRVCR = log of private sector credit (% of GDP). INFL = inflation rate (%). INTR = lending interest rate (%). Sample: 2010Q1–2024Q4 (n = 60).*

Table 2. Pairwise Correlation Matrix

Variable	FII	LNMSMECR	LNPRVCR	INFL	INTR
FII	1				
LNMSMECR	0.73	1			
LNPRVCR	0.88	0.7812	1		
INFL	0.78	0.6543	0.7124	1	
INTR	0.22	0.1873	0.2431	0.431	1

Note: *All correlation coefficients are Pearson (r). Upper triangle omitted. FII correlations are most relevant for explanatory variable screening.*

Unit Root and Cointegration Tests

ADF unit root tests confirm that FII, MSMECR, PRVCR, and INFL are integrated of order one, I(1), while INTR is stationary at level, I(0). No variable is I(2), satisfying the precondition for ARDL estimation. The bounds test yields an F-statistic of 12.32, which exceeds the upper critical bound of 3.813 at the 5% significance level (k = 4), confirming the existence of a long-run cointegrating relationship among the variables (Tables 3 and 4).

Table 3. ADF Unit Root Test Results

Variable	ADF Stat (Level)	p-value	ADF Stat (1st Diff)	p-value	Integration Order
FII	-1.8432	0.3621	-5.4312**	0	I(1)
LNMSMECR	-2.1043	0.2374	-6.1284**	0	I(1)
LNPRVCR	-1.9712	0.3014	-5.8743**	0	I(1)
INFL	-2.3841	0.1543	-6.4312**	0	I(1)
INTR	-3.6214**	0.0074	—	—	I(0)

Note: *** denotes rejection of the null hypothesis of a unit root at the 5% significance level. Lag length selected by Schwarz Information Criterion (SIC). Critical values: MacKinnon (1996). "—" indicates the test was not required beyond the level for I(0) variables.*

Table 4. ARDL Bounds

Test	Value
F-statistic	12.3200**
Number of regressors (k)	4
Critical value bounds (5% significance):	
Lower bound I(0)	2.86
Upper bound I(1)	3.813
Decision	Cointegration confirmed

Note: *** F-statistic exceeds the upper bound I(1) critical value at the 5% level, confirming a long-run cointegrating relationship. Critical values from Pesaran, Shin & Smith (2001), Table CI(iii), Case III. k = number of regressors.*

Short-Run Dynamics

The error correction term (ECT = −0.035, $p < 0.01$) is negative and significant, implying that approximately 3.5% of any deviation from the long-run equilibrium is corrected each quarter. While the pace of adjustment is relatively slow, it is consistent with structural rigidities in Nigeria's financial system. In the short run, MSME credit exerts a negative effect on FII, suggesting that short-run credit expansions may generate inflationary pressures or misallocation effects that temporarily dampen financial inclusion outcomes. Private sector credit has a positive and significant short-run impact, while inflation reduces financial inclusion and interest rate exerts a positive short-run influence, possibly reflecting the procyclical nature of lending activity during periods of higher nominal rates (Table 5).

Table 5. Short-Run Error Correction Model (ECM) Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FII(-1))	0.1843	0.1124	1.6397	0.1065
D(LNMSMECR)	-0.0003	0.0001	-2.1432	0.0364
D(LNMSMECR(-1))	-0.0002	0.0001	-1.8743	0.0654
D(LNPRVCR)	0.0841	0.0312	2.6955	0.0092
D(INFL)	-0.0014	0.0006	-2.3124	0.0243
D(INTR)	0.0021	0.0009	2.1843	0.033
CointEq(-1)*	-0.035	0.0084	-4.1667	0.0001

Note: *Dependent variable: ΔFII. * and ** denote significance at 10% and 5% levels respectively. CointEq(-1) is the error correction term (ECT); its negative and significant coefficient confirms convergence to long-run equilibrium at a speed of approximately 3.5% per quarter. Optimal lag structure selected by AIC.*

Long-Run Estimates

In the long run as depicted in Table 6, MSME credit (coefficient = 0.0002, $p < 0.05$) and interest rate (coefficient = 0.00725, $p < 0.05$) positively and significantly influence financial inclusion. The positive effect of MSME credit confirms that sustained credit flows to small enterprises deepen financial inclusion over time, consistent with findings by Ayunku and Pakepinene (2023), Manasseh, Logan, and Ede (2025), and Musa (2025). The positive long-run interest rate effect, while counterintuitive, may reflect those periods of higher lending rates in Nigeria have historically coincided with intensified financial sector deepening and DMB branch expansion, suggesting that supply-side financial development partially offsets the demand-dampening effect of higher rates. Private sector credit and inflation rate were not statistically significant in the long run, indicating that

aggregate credit depth and macroeconomic instability alone do not determine the trajectory of financial inclusion; rather, the targeting and reach of credit matter more.

Table 6. Long-Run ARDL Coefficient Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNMSMECR	0.0002	0.0001	2.1053	0.0394
LNPRVCR	0.0124	0.0183	0.6776	0.5005
INFL	-0.0008	0.0009	-0.8843	0.3801
INTR	0.0073	0.0031	2.3226	0.0236
C	0.1243	0.0872	1.4254	0.1593

Note: *Dependent variable: FII. ** denotes significance at 5% level. Long-run coefficients are derived from the ARDL levels equation. C = constant term.*

Post-Estimation Diagnostics

Model diagnostics confirm the robustness of the estimates. The Harvey heteroskedasticity test finds no evidence of heteroskedasticity ($F = 1.214$, $p = 0.308$), and the Ramsey RESET test indicates correct model specification (F-stat for $t = 0.559$, $p = 0.579$). The Jarque-Bera test rejects normality of residuals ($JB = 27.32$, $p < 0.01$), with skewness of 1.137 and kurtosis of 5.437; this is a common feature of quarterly macroeconomic data and does not invalidate inference given the sufficient sample size. The CUSUM test confirms parameter stability, as the cumulative sum remains within 5% critical bounds throughout the sample. Overall, the model explains 76.4% of the variation in the financial inclusion index ($R^2 = 0.764$, adjusted $R^2 = 0.747$), with the overall F-statistic of 43.72 ($p < 0.01$) confirming joint significance and the Durbin-Watson statistic of 1.79 indicating the absence of first-order autocorrelation (Table 7).

Table 7. Post-Estimation Diagnostic Summary

Diagnostic Test	**Test Statistic**	**p-value**	**Decision**
R-squared	0.764	—	Good fit
Adjusted R-squared	0.747	—	Good fit
F-statistic (overall)	43.72	0.000	Model significant
Durbin-Watson statistic	1.79	—	No autocorrelation
Harvey heteroskedasticity test	1.214	0.308	No heteroskedasticity
Ramsey RESET test (t-stat)	0.559	0.579	Correct specification
Jarque-Bera normality test	27.32	0.000	Non-normal residuals*
CUSUM stability test	—	—	Parameters stable

Note: ** Non-normality of residuals (Jarque-Bera) is common in quarterly macroeconomic data and does not invalidate inference given n = 60. CUSUM test: parameter stability confirmed as the cumulative sum of recursive residuals remains within 5% critical bounds throughout the sample period.*

CONCLUSION

The empirical evidence carries clear policy implications for Nigeria. First, since MSME credit is the most direct and significant driver of long-run financial inclusion, the CBN and the Federal Government should expand dedicated MSME credit windows, strengthen collateral substitution mechanisms (such as moveable asset registries and credit guarantee schemes), and deepen the reach of development finance institutions to underserved sectors and geographic areas. Second, monetary authorities should pursue interest rate frameworks that keep lending rates at levels compatible with

productive MSME borrowing, since the cost of credit, especially for micro and small enterprises directly affects demand for formal financial services. Third, sustained inflation control is essential to preserving real savings and the purchasing power of credit, even though inflation's long-run coefficient was insignificant in this study; its significant short-run negative effect warrants attention. Fourth, improving credit information infrastructure and expanding credit bureau coverage will reduce information asymmetry, lower risk premiums, and allow DMBs to price MSME loans more competitively.

In conclusion, this study demonstrates that MSME credit is a statistically significant and positive long-run driver of inclusive growth in Nigeria, as proxied by a composite financial inclusion index. Interest rate also exerts a significant supportive long-run effect, while private sector credit and inflation rate do not produce meaningful long-run impacts on financial inclusion. These findings affirm the centrality of targeted MSME financing in Nigeria's development strategy. Broadening affordable credit access to small enterprises remains a critical pathway to job creation, poverty reduction, and broad-based sustainable economic growth.

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