



The moderating effect of financial inclusion on the relationship between mobile banking and economic growth in Nigeria

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Abstract

This study examines the moderating effect of financial inclusion on the relationship between mobile banking and economic growth in Nigeria using time-series data from 2012 to 2025. Employing the Autoregressive Distributed Lag (ARDL) bounds-testing approach, the study analyzes short-run and long-run dynamics. The findings indicate that mobile banking has a positive and statistically significant effect on economic growth in the short run ($\beta = 35.82, p = 0.016$) and long run ($\beta = 501.19, p = 0.001$). Financial inclusion also exhibits a positive and statistically significant effect on GDP in the short run ($\beta = 30.74, p = 0.006$) and long run ($\beta = 526.89, p = 0.003$). The interaction term between mobile banking and financial inclusion (MB_FI) is positive and statistically significant ($\beta = 6.22, p = 0.012$), indicating that financial inclusion strengthens the growth-enhancing effect of mobile banking. The error-correction coefficient is negative and statistically significant ($-0.1308, p = 0.043$); this result shows significant adjustment coefficient for convergence toward long-run equilibrium. Diagnostic tests indicate no evidence of heteroskedasticity or serial correlation, and the model is reported as stable. The study recommends investment in digital financial infrastructure, strengthened regulatory frameworks, expanded financial inclusion programmes, and improved digital literacy to enhance the contribution of mobile banking to inclusive economic growth in Nigeria.

Keywords: Mobile Banking; Financial Inclusion; Economic Growth; Nigeria; Moderating Effect; ARDL

1. Introduction

1.1 Background of the Study

Economic growth is a key goal of macroeconomic policy and an important measure of economic performance. It refers to a sustained increase in the value of goods and services produced within an economy over time and is commonly measured using real Gross Domestic Product (GDP). Economic



growth is important for improving living standards, reducing poverty and expanding employment opportunities (World Bank, 2024). In developing economies, growth is influenced by structural, institutional and macroeconomic factors, including capital formation, technological advancement, human capital development, trade openness and the efficiency of financial systems (Adeleye et al., 2023; Olanrewaju & Adebayo, 2024).

Digital finance has emerged as an important channel through which financial systems can become more efficient, accessible and inclusive. Mobile banking facilitates faster and more convenient financial transactions, potentially reducing transaction costs and improving productivity (Demirgüç-Kunt et al., 2022). It enables individuals and businesses to transfer funds, make payments and manage accounts through mobile devices, thereby reducing reliance on physical bank branches (International Monetary Fund, 2023).

Financial inclusion is similarly important because it enables individuals and businesses to access and use appropriate, affordable financial services, including savings, credit, insurance and payment systems. Wider participation in the formal financial system can mobilise savings and support investment and productive activity (World Bank, 2024). In Nigeria, the expansion of mobile banking has occurred alongside policy initiatives aimed at improving financial inclusion, including the National Financial Inclusion Strategy and Payments System Vision 2025. Nevertheless, the extent to which financial inclusion changes the relationship between mobile banking and economic growth remains insufficiently established.

1.2 Statement of the Problem

Economic growth remains a major policy objective in Nigeria because of its implications for living standards, employment and poverty reduction. Although Nigeria has recorded periods of moderate growth, the pace of expansion has often been insufficient relative to population growth (Adebayo et al., 2023; Iyke & Ho, 2021). At the same time, digital finance, particularly mobile banking, has expanded rapidly and has simplified financial transactions.

However, the economic benefits of mobile banking may depend on the extent to which households and businesses are integrated into the formal financial system. A substantial proportion of the population remains underserved by formal financial institutions, limiting opportunities to save,



borrow and invest (Adewuyi & Oke, 2020). Existing studies have largely examined the direct relationship between digital finance and economic growth, while comparatively limited attention has been paid to the possibility that financial inclusion changes the strength of the mobile banking–growth relationship. This gap is important because the effectiveness of mobile banking may vary according to the level of access to and use of formal financial services. Consequently, this study examines whether financial inclusion moderates the relationship between mobile banking and economic growth in Nigeria.

1.3 Objective of the Study

The specific objective of this study is to evaluate the moderating effect of financial inclusion on the relationship between mobile banking and economic growth in Nigeria.

1.4 Research Question

To what extent does financial inclusion moderate the relationship between mobile banking and economic growth in Nigeria?

1.5 Research Hypothesis

H₀: Financial inclusion does not significantly moderate the relationship between mobile banking and economic growth in Nigeria.

1.6 Significance of the Study

The study contributes to understanding the conditions under which mobile banking can support economic growth in a developing economy. Its focus on financial inclusion as a moderating variable provides a more nuanced perspective than an assessment of the direct mobile banking–growth relationship alone. The findings are relevant to policymakers, financial institutions, regulators and researchers concerned with digital financial development and inclusive economic growth in Nigeria.



2. Literature Review

2.1 Conceptual Review

2.1.1 Mobile Banking

Mobile banking refers to the delivery and use of banking services through mobile devices, including applications and SMS-based platforms. It enables customers to undertake activities such as fund transfers, balance enquiries and bill payments without visiting a physical branch (Klein & Mayer, 2011; World Bank, 2022). Mobile banking can therefore reduce geographic and transaction-cost barriers and facilitate participation in formal financial systems.

2.1.2 Financial Inclusion

Financial inclusion concerns the extent to which individuals and businesses can access and use formal financial services such as savings, payments, credit and insurance (World Bank, 2022). Digital financial inclusion extends this concept through digital channels such as mobile banking, internet banking and electronic payment systems. By reducing barriers related to distance, cost and physical infrastructure, digital channels can widen access to financial services.

2.1.3 Moderating Effect of Financial Inclusion

A moderating variable changes the strength or direction of the relationship between an explanatory variable and an outcome variable. In this study, financial inclusion is expected to influence the strength of the relationship between mobile banking and economic growth. Where access to formal financial services is broader, mobile banking may have a stronger growth effect because more individuals and firms are able to use digital financial services productively.

2.2 Theoretical Review

2.2.1 Financial Intermediation Theory

Financial Intermediation Theory explains how financial institutions and markets mobilise savings, allocate resources to productive investments, manage risks and reduce transaction and information costs. The theory is associated with the development of ideas on financial intermediation by Schumpeter and later financial-development literature. Mobile banking represents a technological



extension of financial intermediation because it can lower transaction costs, increase accessibility and accelerate financial transactions. Financial inclusion ensures that these benefits reach a broader segment of the population (Beck et al., 2023; Sahay et al., 2022; Ozili, 2023).

2.2.2 Endogenous Growth Theory

Endogenous Growth Theory holds that long-run economic growth can arise from investments in human capital, innovation, knowledge and technology (Romer, 1986, 1990). Efficient financial systems facilitate savings mobilisation and the allocation of resources to productive activities. Mobile banking can support this process by improving financial access and transaction efficiency, while financial inclusion broadens participation in economic and financial activities.

2.3 Empirical Review

Ajakaiye and Tella (2020) investigated the relationship between mobile banking and economic performance in Nigeria using quarterly observations covering 2010–2018 and a Vector Autoregression (VAR) framework. Their analysis revealed that mobile banking contributed positively to GDP in the short term, whereas its influence became statistically insignificant over the longer term. This outcome suggests that the immediate economic gains associated with mobile banking may not necessarily develop into sustained growth. In the short term, increased mobile banking activity may stimulate economic transactions by lowering the costs and time required to transfer funds and make payments. However, the disappearance of the effect in the long run raises an important question about whether the expansion of mobile banking, by itself, is sufficient to produce lasting improvements in productive capacity. From our perspective, the finding highlights the relevance of the environment in which digital banking services are utilised. Limited access to formal financial institutions, inadequate digital infrastructure, insufficient financial knowledge and weak opportunities for productive use of digital financial services may restrict the extent to which higher mobile banking activity generates enduring macroeconomic benefits.

Oladapo and Olofin (2021) provide further insight into this issue by examining digital financial inclusion across Nigeria's 36 states using panel data for the period 2011–2020. Their findings indicate that greater digital financial inclusion was associated with increased economic activity, although



significant differences existed across regions in the adoption of digital financial services. This evidence suggests that the economic consequences of digital finance cannot be assumed to be identical across locations. The extent to which households and firms are connected to and capable of using the formal financial system appears to influence the benefits they derive from digital financial technologies. Consequently, simply increasing the availability of mobile or digital financial platforms may not produce similar economic outcomes in all parts of the country. Variations in infrastructure, income levels, financial access, digital competence and institutional conditions can determine whether digital financial services are converted into meaningful economic opportunities. This observation gives financial inclusion a potentially broader role than that of an ordinary explanatory variable, as its level may determine how effectively mobile banking contributes to economic performance.

In a related Nigerian study, Ojo et al. (2022) employed the ARDL bounds-testing technique with annual data covering 2005–2020 and established that mobile transactions exerted a positive and statistically significant long-run effect on GDP. This result differs from the long-run evidence reported by Ajakaiye and Tella (2020), thereby demonstrating that the relationship between mobile banking and economic growth remains empirically unsettled. While Ajakaiye and Tella's findings suggest that the benefits of mobile banking may be concentrated in the short term, Ojo et al. provide evidence that such benefits can persist over an extended period. These divergent outcomes may be partly attributable to differences in the periods examined, data frequency and estimation techniques. Nevertheless, the inconsistency is theoretically relevant because it suggests that the effect of mobile banking may be contingent upon the wider financial and economic conditions within which it operates. Accordingly, research should move beyond establishing whether mobile banking affects growth and pay greater attention to the factors that determine the magnitude and persistence of that effect.

At the international level, Sahay et al. (2020) examined the relationship between digital financial inclusion and economic growth using data from 52 countries covering 2000–2019 and a Generalized Method of Moments (GMM) estimation technique. Their evidence points to a positive association between digital financial inclusion and GDP growth, supporting the proposition that wider access to



digital financial services can contribute to improved economic performance. However, the cross-country design of the study may mask differences in national financial systems, institutional arrangements and levels of technological development. The implications for Nigeria are therefore not necessarily identical to those observed across the countries in their sample. In particular, where financial exclusion remains substantial and digital infrastructure is unevenly distributed, the extent to which mobile banking produces growth-enhancing outcomes may depend on whether users have effective access to and meaningful participation in the formal financial system.

The combined evidence from these studies presents an interesting but incomplete picture. On the one hand, existing empirical research generally supports the view that mobile banking and digital financial inclusion can contribute positively to economic activity. On the other hand, the differences in the reported short-run and long-run effects indicate that the relationship is more complex than a simple direct association. Ajakaiye and Tella (2020) identify a short-run benefit without a significant long-run effect, whereas Ojo et al. (2022) report a significant long-run contribution. Similarly, the regional variations identified by Oladapo and Olofin (2021) demonstrate that access to digital financial services does not necessarily translate into uniform economic benefits. These inconsistencies suggest that attention should be given to the conditions that enable digital finance to produce stronger and more sustainable economic outcomes.

Against this background, this study considers financial inclusion as a potentially important conditioning factor. The underlying argument is that mobile banking is likely to generate greater economic benefits when individuals and businesses are sufficiently integrated into the formal financial system. Financial inclusion can provide the institutional and financial channels through which digital transactions become associated with saving, credit, investment, payments and other productive activities. Consequently, the contribution of mobile banking to economic growth may depend not only on the volume or availability of mobile banking services but also on the extent to which users can participate meaningfully in the broader financial system.

The present study therefore extends the existing literature by treating financial inclusion as a moderating variable in the relationship between mobile banking and economic growth. Rather than



considering financial inclusion solely as an independent determinant of GDP, the study investigates whether variations in financial inclusion alter the strength of the effect of mobile banking on economic growth. This approach provides a more comprehensive interpretation of the mixed evidence in the literature and offers an explanation for why the economic effects of mobile banking may differ across periods and contexts. More importantly, it shifts the focus from the simple expansion of digital banking services to the broader question of whether an inclusive financial environment enables those services to generate stronger economic growth outcomes.

2.4 Gap in the Literature

The reviewed literature predominantly focuses on direct relationships between mobile banking or digital financial inclusion and economic growth. Financial inclusion has commonly been treated as an independent variable rather than as a variable that changes the strength of the mobile banking–growth relationship. This study addresses that gap by incorporating an interaction term between mobile banking and financial inclusion within an ARDL framework for Nigeria.

3. Methodology

3.1 Research Design

The study adopts an ex post facto research design using secondary time-series data. The design is appropriate because the study analyses already-existing observations without manipulating the explanatory variables. The study examines mobile banking as the explanatory variable, GDP as the measure of economic growth, and financial inclusion as the moderating variable.

3.2 Study Area

The study is geographically delimited to Nigeria. Nigeria provides a relevant setting because of its expanding digital financial ecosystem, substantial mobile-phone penetration and continuing financial inclusion challenges, particularly among underserved populations.

3.3 Data Sources and Measurement

The study relies on secondary data obtained from the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), Nigeria Inter-Bank Settlement System (NIBSS) and the World Bank



Global Findex Database. The study period is 2012–2025, with 56 quarterly observations as reported in the source document.

3.4 Model Specification

To estimate the moderating effect of financial inclusion, the study specifies:

$$GDP_t = \beta_0 + \beta_1 MOB_t + \beta_2 FI_t + \beta_3 (MOB_t \times FI_t) + \beta_4 X_t + \varepsilon_t$$

where GDP_t represents economic growth measured by real GDP; MOB_t represents mobile banking transactions; FI_t represents financial inclusion; $MOB_t \times FI_t$ is the interaction term; X_t represents control variables; and ε_t is the error term. The interaction coefficient β_3 is the principal coefficient for testing the moderating effect.

3.5 Estimation Procedure

The study employs the ARDL approach to estimate short-run and long-run relationships. The procedure comprises unit-root testing using the ADF, Phillips–Perron and KPSS tests; the ARDL bounds test for cointegration; estimation of long-run and short-run coefficients through the ARDL error-correction representation; and diagnostic and stability tests covering serial correlation, heteroskedasticity, normality and parameter stability.

4. Results

4.1 Descriptive Statistics

Table 1. Descriptive Statistics

Variable	N	Mean	SD	Min	Max
GDP	56	2.629	2.291	-1.800	6.300
MOB	56	1.884	1.497	0.053	3.970
FIN	56	15.899	13.842	-4.000	53.801

Source: Stata 14.

Table 1 reports the descriptive statistics. GDP has a mean of 2.629 and a standard deviation of 2.291. Mobile banking has a mean of 1.884 and a standard deviation of 1.497. Financial inclusion has the



highest reported mean (15.899) and a standard deviation of 13.842, indicating substantial variation over the study period.

4.2 Correlation Analysis

Table 2. Correlation Matrix

Variables	GDP	MOB	FIN
GDP	1.000		
MOB	0.607**	1.000	
FIN	0.544*	0.877**	1.000

* $p < 0.05$; ** $p < 0.01$. Source: Stata 14.

The correlation matrix indicates a positive and statistically significant relationship between mobile banking and GDP ($r = 0.607$, $p < 0.01$). Mobile banking is also strongly correlated with financial inclusion ($r = 0.877$, $p < 0.01$), while the correlation between GDP and financial inclusion is positive ($r = 0.544$, $p < 0.05$). The VIF results indicate no serious multicollinearity problem.

4.3 Unit Root Tests

Table 3. Augmented Dickey–Fuller Unit Root Test

Variable	Test Statistic	p-value	Reported Integration Order
GDP	-5.616	0.202	I(1)
MOB	-6.269	0.017	I(0)
FIN	-5.201	0.019	I(0)

Source: Stata 14.

The ADF results indicate that GDP is non-stationary at level and stationary after first differencing, while mobile banking and financial inclusion are stationary at level. The mixed I(0)/I(1) integration pattern supports the use of ARDL, since none of the variables is integrated of order two or higher.



4.4 Bounds Test for Cointegration

Table 4. ARDL Bounds Test for Cointegration

Test Statistic	Value	Significance	I(0) / I(1) Bounds
F-statistic	5.67	5%	3.62 / 4.62

Decision: Reject the null hypothesis of no cointegration at 5%. Source: Stata 14.

The bounds-test F-statistic is 5.67, exceeding the 5% upper-bound critical value of 4.62. The null hypothesis of no cointegration is therefore rejected at the 5% level, providing evidence of a long-run relationship among the variables.

4.5 ARDL Regression Results

Table 5. ARDL Regression Results

Predictor	Coefficient	Std. Error	t-value	p-value	95% CI
MOB	5.03	15.96	8.31	0.002	[-42.78, 32.72]
FIN	5.87	63.05	6.33	0.030	[-128.23, 169.97]
MB_FI	6.22	3.96	7.06	0.012	[-9.59, 9.15]

Source: Stata 14.

The interaction term (MB_FI) has a positive coefficient of 6.22 with $p = 0.012$, indicating a statistically significant moderating effect at the 5% level. Mobile banking also has positive and statistically significant reported short-run and long-run coefficients, while financial inclusion is positive and statistically significant in both periods.

5. Discussion of Findings

The findings indicate that financial inclusion significantly strengthens the relationship between mobile banking and economic growth in Nigeria. The positive interaction coefficient ($\beta = 6.22$, $p = 0.012$) suggests that the growth-enhancing contribution of mobile banking becomes stronger as financial inclusion increases. This is consistent with Financial Intermediation Theory because broader



access to formal financial services can increase the capacity of mobile banking to mobilise savings, facilitate payments and support productive investment.

The result also accords with Endogenous Growth Theory, which emphasises the role of technology, innovation and human capital in generating sustained economic growth. By increasing access to digital financial services, financial inclusion can widen participation in economic activity and allow technological improvements in banking to translate into broader productive benefits.

The reported positive effects of mobile banking in both the short and long run further suggest that digital financial services can contribute to economic activity by reducing transaction frictions and improving access to financial services. Similarly, the positive effects associated with financial inclusion support the view that broader access to formal financial services can enhance resource mobilisation and productive activity.

5.1 Diagnostic Results

Table 7. Diagnostic Tests

Test	Statistic	p-value	Reported Decision
Breusch–Pagan heteroskedasticity	1.276	0.293	No heteroskedasticity
Breusch–Godfrey serial correlation	1.842	0.169	No serial correlation
Shapiro–Wilk normality	W = 0.909	0.276	Normal residuals
Mean VIF	4.93	—	No serious multicollinearity

Source: Stata 14.

The Breusch–Pagan test ($p = 0.293$) indicates no evidence of heteroskedasticity, while the Breusch–Godfrey test ($p = 0.169$) indicates no evidence of serial correlation. The reported Shapiro–Wilk test gives $p = 0.276$, and the mean VIF is 4.93. The study also revealed that the CUSUM and CUSUMSQ tests confirm parameter stability.



6. Conclusion and Policy Implications

6.1 Conclusion

The study concludes that mobile banking has a positive association with economic growth in Nigeria and that financial inclusion significantly moderates this relationship. The significant positive interaction effect indicates that the contribution of mobile banking to economic growth is stronger when access to formal financial services is broader. The findings therefore support a coordinated policy approach that promotes both digital financial services and financial inclusion.

6.2 Policy Recommendations

First, policymakers should expand mobile banking infrastructure, particularly in rural and underserved areas, while encouraging partnerships that improve network coverage and reduce transaction costs. Second, financial inclusion policies should be strengthened through simplified account opening, affordable banking services and expanded agent banking. Third, mobile banking initiatives should be integrated into broader financial inclusion strategies, including interoperability between mobile platforms and formal banking services. Fourth, regulatory frameworks should continue to promote security, consumer confidence and interoperability. Fifth, digital and financial literacy programmes should be strengthened so that users can access and use mobile banking services safely and effectively.

6.3 Contribution to Knowledge

The study contributes by treating financial inclusion as a moderator rather than only as an independent explanatory variable. This approach provides evidence on the conditions under which mobile banking can have a stronger effect on economic growth. The study also contributes to the application of the ARDL framework to a moderation model involving mobile banking and financial inclusion in Nigeria.

6.4 Limitations and Suggestions for Future Research

The study is limited by its focus on mobile banking and financial inclusion, whereas GDP is influenced by several other macroeconomic variables. Future studies may incorporate additional controls such as inflation, interest rates and government expenditure. The reported sample of 56



observations is also relatively small, suggesting that future research could use a longer period or higher-frequency data where available. The single-country design limits generalisability, while the linear ARDL framework may not capture asymmetric relationships. Future studies may therefore employ comparative country designs, NARDL or VECM approaches.

Tables

Table 6. Long-Run and Short-Run ARDL Relationships

Component	Variable	Coefficient	Std. Error	t-value	p-value
Error Correction	L1.GDP	-0.1308	0.2547	6.51	0.043
Long Run	L1.MOB	501.19	970.27	8.52	0.001
Long Run	L1.FIN	526.89	1066.55	6.49	0.003
Short Run	D.MOB	35.82	7.28	7.92	0.016
Short Run	D.FIN	30.74	14.02	5.19	0.006

Source: Stata 14.

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