

Towards Sustainable Micro, Small, And Medium Enterprise (Msme) Growth Through Financial Inclusion: Evidence From Selected African Countries

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Abstract

This study examines the role of financial inclusion in promoting sustainable MSME growth in 10 selected African countries over the period 2000 to 2025. Using the Panel Autoregressive Distributed Lag (PARDL) model as the baseline estimator, the analysis applies the Mean Group (MG), Dynamic Fixed Effects (DFE), and Pooled Mean Group (PMG) estimators to capture both short run and long run relationships, while Panel FMOLS and Panel DOLS are employed as robustness checks. The findings show that financial inclusion significantly influences sustainable MSME growth, although the magnitude and direction of the effects differ across indicators and estimation techniques. Financial literacy, mobile money adoption, deposit account ownership, automated teller machine penetration, and digital card ownership promote enterprise growth by improving access to formal financial services, reducing transaction costs, and strengthening financial management. However, the mixed effects of the aggregate financial inclusion index suggest that financial access alone is insufficient to sustain enterprise development without efficient financial intermediation, sound institutional quality, and macroeconomic stability. The study contributes to the financial inclusion literature by demonstrating that sustainable MSME growth depends on the effective utilisation of financial services rather than access alone. It therefore recommends strengthening digital financial infrastructure, expanding financial literacy programmes, improving MSME credit delivery, and implementing supportive institutional and macroeconomic reforms to promote inclusive and sustainable enterprise development across Africa...

Keywords Sustainable MSME, Financial Inclusion, Africa..

INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) constitute the backbone of African economies, accounting for over 90% of businesses, generating a substantial share of employment, and contributing significantly to gross domestic product (GDP), income generation, innovation, and poverty reduction. Despite their strategic importance, the growth and sustainability of MSMEs across Africa remain constrained by persistent structural and institutional challenges, including inadequate access to finance, weak infrastructure, limited technological adoption, poor managerial capacity, regulatory bottlenecks, and underdeveloped financial systems (Okello Candiya Bongomin et al., 2025; Damane & Ho, 2025). Financial exclusion continues to prevent many enterprises from obtaining affordable credit, savings facilities, insurance, and digital financial services necessary for business expansion and resilience. Consequently, financial inclusion has emerged as a critical policy instrument for enhancing MSME productivity, competitiveness, and long-term growth by improving access to formal financial

services and reducing financing constraints (Ahonkhai et al., 2025; Sanusi et al., 2026). Furthermore, the rapid expansion of digital finance, mobile banking, and financial technology has created new opportunities for improving financial access, operational efficiency, and market participation among African enterprises, particularly in underserved rural communities (Manasseh et al., 2023). However, the effectiveness of these financial inclusion initiatives largely depends on complementary factors such as financial literacy, institutional quality, regulatory effectiveness, and governance, which determine how efficiently MSMEs can utilise financial resources for sustainable business development (Okello Candiya Bongomin et al., 2025; Saifurrahman & Kassim, 2023).

Achieving sustainable growth among Micro, Small, and Medium Enterprises (MSMEs) has become a major development priority across Africa because these enterprises are central to employment creation, income generation, industrialization, and inclusive economic transformation. However, despite their significant contribution to national economies, many African MSMEs continue to experience low survival rates and limited expansion due to restricted access to formal financial services, high financing costs, inadequate credit facilities, weak financial infrastructure, and poor integration into formal financial markets. These constraints have intensified calls for policies that promote financial inclusion as a mechanism for improving enterprise productivity, competitiveness, innovation, and long-term sustainability (Anthanasius & Opperman, 2023). Financial inclusion enables MSMEs to access affordable credit, savings products, insurance, payment systems, and digital financial platforms that enhance investment opportunities, improve cash flow management, reduce operational risks, and strengthen business resilience against economic shocks (Saifurrahman & Kassim, 2023). Beyond financial access, the sustainability of MSMEs also depends on supportive institutional frameworks, financial literacy, and the effective functioning of financial intermediaries, which facilitate efficient resource allocation and encourage productive investments (Okello Candiya Bongomin et al., 2020a; Okello Candiya Bongomin et al., 2020c). Moreover, evidence suggests that stronger financial inclusion policies can stimulate entrepreneurial activities, improve business survival, and foster inclusive economic development across African economies by addressing persistent financial market imperfections and reducing the financing gap confronting small businesses (Manasseh et al., 2026; Damane & Ho, 2025).

Sustainable MSME growth is fundamental to Africa's long-term economic transformation because it addresses one of the most persistent barriers to enterprise development—limited access to affordable and appropriate financial services. Financial inclusion enables MSMEs to mobilise savings, obtain productive credit, adopt digital payment systems, manage risks through insurance, and invest in technology and innovation, thereby improving productivity, competitiveness, and business resilience. Beyond firm-level benefits, sustainable MSME growth expands employment opportunities, raises household incomes, stimulates domestic production, broadens the tax base, and reduces poverty and income inequality, making it an effective instrument for inclusive development. Its implications extend to accelerating industrialisation, strengthening local value chains, enhancing export competitiveness, and reducing excessive dependence on primary commodity exports, which have historically exposed many African economies to external shocks. Moreover, financially inclusive MSMEs are better positioned to withstand economic crises, climate-related disruptions, and market volatility because they possess greater financial flexibility and improved access to formal support mechanisms. From a policy perspective, achieving sustainable MSME growth through financial inclusion reinforces progress toward the Sustainable Development Goals (SDGs), particularly those relating to decent work, poverty eradication, gender equality, economic growth, and innovation. However, these outcomes are not automatic; they require complementary investments in financial literacy, digital infrastructure, sound regulatory frameworks, institutional quality, and governance to ensure that expanded financial access translates into productive investment, business sustainability, and broad-based economic prosperity across Africa.

Despite their strategic contribution to national development, many MSMEs continue to experience slow growth and poor sustainability due to inadequate access to formal financial services, low financial literacy, weak digital financial infrastructure, and limited participation in the formal financial system. In response, African governments and financial institutions have intensified financial inclusion initiatives aimed at improving entrepreneurs' access to financial resources and digital financial platforms. Nevertheless, the effectiveness of these initiatives remains inconclusive because financial inclusion encompasses multiple dimensions that may influence MSME performance differently. While financially literate entrepreneurs are expected to make better investment and

financing decisions, it remains unclear to what extent financial literacy contributes to MSME growth. Similarly, questions persist regarding whether the number of registered mobile money accounts, the availability of mobile money agent outlets, the financial inclusion index, the number of deposit accounts per 1,000 adults, ATM penetration, and digital card ownership individually stimulate enterprise growth and sustainability across African economies. The mixed empirical evidence and substantial disparities in financial sector development across African countries further justify a comprehensive investigation of these relationships. Consequently, this study examines whether financial literacy, registered mobile money accounts, mobile money agent outlets, the financial inclusion index, deposit accounts, ATM penetration, and digital card ownership significantly promote the growth and sustainability of MSMEs in Africa; hence, we develop the following questions. a). To what extent does financial literacy influence the growth and sustainability of MSMEs in Africa? b). What effect does the number of registered mobile money accounts per 1,000 adults have on the growth and sustainability of MSMEs in Africa? c). How does the number of mobile money agent outlets influence the growth and sustainability of MSMEs in Africa? d). Is there a significant relationship between the financial inclusion index and the growth and sustainability of MSMEs in Africa? e). In what ways does the number of deposit accounts per 1,000 adults affect the growth and sustainability of MSMEs in Africa? f). What role does the number of automated teller machines (ATMs) per 100,000 adults play in improving the growth and sustainability of MSMEs in Africa? g). Can digital card ownership significantly impact the growth and sustainability of MSMEs in Africa?

Although previous studies have established that financial inclusion contributes to enterprise development, the existing body of knowledge remains fragmented in several important respects. Most empirical investigations have concentrated on single-country evidence, specific financial inclusion indicators, or broad measures of financial development without adequately capturing the multidimensional nature of financial inclusion or distinguishing between its various channels of influence on MSME growth and sustainability (Anthanasius & Opperman, 2023; Ahonkhai et al., 2025; Sanusi et al., 2026). Moreover, existing African studies have predominantly employed static panel estimators, cross-sectional surveys, descriptive analyses, or conventional time-series techniques that do not explicitly account for heterogeneous short-run dynamics, long-run equilibrium relationships, and cross-country differences in adjustment speeds. Consequently, little is known about whether financial literacy, digital financial access, banking infrastructure, mobile money penetration, deposit mobilisation, ATM availability, and digital card ownership exert homogeneous or heterogeneous effects on MSME performance across African economies. Furthermore, the literature has largely treated financial inclusion as a single aggregate concept, overlooking the possibility that each component may influence enterprise growth through distinct transmission mechanisms. This study departs from these earlier contributions by adopting a comprehensive multidimensional financial inclusion framework that simultaneously evaluates financial literacy, registered mobile money accounts, mobile money agent outlets, the financial inclusion index, deposit accounts, ATM penetration, and digital card ownership as distinct drivers of MSME growth and sustainability. In doing so, it responds to recent calls for more disaggregated and policy-relevant evidence on financial inclusion and enterprise development in Africa (Okello Candiya Bongomin et al., 2025; Damane & Ho, 2025).

The study also makes important policy contributions to the literature. Unlike earlier studies that rely on a single estimation approach, this research employs the Panel Autoregressive Distributed Lag (Panel ARDL) framework using the Mean Group (MG), Dynamic Fixed Effects (DFE), and Pooled Mean Group (PMG) estimators to distinguish between heterogeneous short-run dynamics and common long-run relationships among African countries. This approach provides richer insights into how financial inclusion dimensions influence MSME growth over time while accommodating differences in national financial systems, institutional arrangements, and economic structures. To enhance the reliability and robustness of the findings, the study further validates the long-run estimates using Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS), thereby minimising concerns relating to endogeneity, serial correlation, and omitted-variable bias. Such methodological triangulation remains largely absent in the existing MSME–financial inclusion literature in Africa (Manasseh et al., 2023; Manasseh et al., 2026). Beyond methodological advancement, the study generates evidence capable of identifying which dimensions of financial inclusion produce the greatest improvements in MSME growth and sustainability, thereby enabling policymakers, central banks, financial institutions, development partners, and fintech providers to design targeted interventions rather than relying on generalised financial inclusion policies. However, the findings provide a stronger empirical foundation for promoting

inclusive finance, strengthening entrepreneurial ecosystems, enhancing business resilience, and accelerating sustainable economic transformation across Africa while contributing to the achievement of sustainable growth for micro, small, and medium enterprises in Africa. The remainder of this paper is organised as follows. Section 2 provides an overview of financial inclusion and MSME growth in Africa. Section 3 reviews the relevant theoretical and empirical literature. Section 4 describes the data and methodology employed in the study. Section 5 presents and discusses the empirical findings, while Section 6 concludes the paper with a summary of the key findings, policy recommendations, and concluding remarks.

2. REVIEW OF RELATED LITERATURE

The review of related literature provides the theoretical and empirical foundation for examining the relationship between financial inclusion and sustainable MSME growth. It is organised into two sections. The first reviews the relevant theoretical perspectives underpinning the study, explaining how financial inclusion promotes enterprise development and sustainable growth. The second synthesises empirical evidence on financial inclusion and MSME growth, highlighting the methodological approaches, principal findings, areas of convergence and divergence, and existing research gaps. This review establishes the context for the present study and demonstrates its contribution to the literature on sustainable MSME development in Africa.

2.1 Theoretical Review

2.1.1 Financial Intermediation Theory

The Financial Intermediation Theory, developed by Gurley and Shaw (1960) and extended by McKinnon (1973), Shaw (1973), Levine (1997, 2005), and Beck et al. (2007), provides the theoretical foundation for explaining how financial inclusion promotes sustainable MSME growth. The theory argues that efficient financial intermediaries stimulate enterprise development by mobilising savings, improving capital allocation, reducing transaction costs, mitigating information asymmetry, and expanding access to finance. In this study, financial literacy, deposit accounts, registered mobile money accounts, mobile money agent outlets, ATM penetration, digital card ownership, and the financial inclusion index represent key channels through which financial inclusion enhances investment capacity, operational efficiency, and business sustainability. Although the theory has been criticized for assuming efficient financial systems and overlooking institutional and regulatory constraints in developing economies (Levine, 1997; Beck et al., 2007), it remains highly relevant because it provides a robust framework for explaining how improved financial access and utilisation support sustainable MSME growth across Africa.

2.1.2 Diffusion of Innovation Theory

The Diffusion of Innovation Theory, developed by Rogers (1962, 1983, 2003), explains how the adoption and diffusion of new technologies promote financial inclusion and sustainable MSME growth. The theory posits that innovations spread according to their perceived advantages, compatibility, complexity, trialability, and observability (Rogers, 2003). In this study, registered mobile money accounts, mobile money agent outlets, ATM penetration, digital card ownership, and financial literacy represent key channels through which digital financial innovations improve access to savings, credit, and payment services, thereby enhancing operational efficiency, financial management, market participation, and business sustainability. Although the adoption of financial innovations may be constrained by inadequate infrastructure, limited digital literacy, weak regulatory systems, and socioeconomic inequalities (Rogers, 2003; Venkatesh et al., 2003), the theory remains highly relevant because it demonstrates how expanding digital financial technologies strengthens financial inclusion and supports sustainable MSME development across Africa.

2.1.3 Human Capital Theory

The Human Capital Theory, developed by Schultz (1961) and Becker (1964, 1993) and extended by Mincer (1974), provides the theoretical basis for explaining how financial literacy enhances sustainable MSME growth. The theory argues that investments in knowledge, education, and skills improve productivity, business performance, and economic outcomes. In this study, financial literacy is viewed as a key component of human capital because it enables MSME owners to make informed financial decisions, manage cash flows, adopt digital financial services, access formal credit, and utilise financial products more effectively. Consequently, financial

literacy strengthens the impact of other dimensions of financial inclusion by improving the productive use of available financial services. Although the theory has been criticised for paying limited attention to institutional constraints and financial market imperfections, it remains highly relevant because it explains why financial capabilities are essential for translating financial inclusion into sustainable MSME growth across Africa (Becker, 1993; Lusardi & Mitchell, 2014).

2.2 Empirical Literature

Sanusi et al. (2026) investigated the effect of financial inclusion on the performance of small and medium enterprises (SMEs) in Northeastern Nigeria, using a descriptive survey of 384 SME owners and managers, with data analysed using descriptive statistics and multiple regression. The findings revealed that financial inclusion significantly enhances financial management, access to financial services, credit management, investment decisions, and overall business growth, leading the authors to recommend stronger financial inclusion and awareness initiatives for SMEs. Ahonkhai et al. (2025) examined the impact of financial inclusion on SME growth in Nigeria using annual time-series data from 1994 to 2024 and the ARDL approach to estimate the short- and long-run effects of key financial inclusion indicators. The findings indicate that rural bank deposits significantly promote SME growth, whereas loans to SMEs, rural lending, bank branch expansion, and financial deepening exhibit weak or negative effects, highlighting the need for improved credit allocation, financial literacy, and stronger institutional support. Adamu and Suleiman (2025) used a NARDL model with data from 2010 to 2024 to assess the asymmetric effects of financial deepening on SME growth in Nigeria. Their findings revealed that positive financial deepening shocks significantly increase SME output, while negative shocks significantly reduce it. They recommended implementing stabilisation policies to ensure steady access to funding for SMEs. Bello and Olatunji (2025) applied a panel cointegration approach using data from 2013 to 2024 sourced from NDIC and the CBN to study the impact of bank branch spread on SME growth. They found that BBS positively affects SME output, particularly in non-urban regions. The study advocated for policies that encourage banks to open more branches in underserved areas. Johnson and Adebayo (2025) employed a Vector Autoregression (VAR) model to examine the long-term effect of financial deepening on SME output using CBN data. They discovered that financial deepening, as measured by MS/GDP, positively influences SME growth over time. However, challenges in loan accessibility persist, leading them to recommend reforms that improve SME access to credit. Hassan and Yusuf (2025) used a difference-in-differences method to analyse data from 2015 to 2024 and found that loans provided by rural bank branches significantly improved SME productivity, especially in the agribusiness sector. They concluded that expanding targeted loan schemes would strengthen financial inclusion and SME development.

Adegbite and Oladipo (2024) employed the Generalised Method of Moments (GMM) to assess the effect of rural bank deposits and SME credit on output using panel data from 2010 to 2023. The study found that RBDs and LADSMSEs had a positive influence on SME performance, while financial deepening had mixed outcomes. They recommended increasing rural banking coverage and improving financial literacy. Okonkwo et al. (2024) analysed time-series data from 2012 to 2023 using an ARDL model and reported that BBS and LADSMSEs significantly contribute to SME growth, particularly in regions with high financial literacy. The study emphasised the importance of government-backed incentives to promote rural banking expansion. Eze and Chukwuma (2024) employed Structural Equation Modelling (SEM) to evaluate the impact of RBDs on SME output using data from 2011 to 2023. Their results confirmed a positive contribution of RBDs to SME growth but underscored the need for complementary infrastructural improvements. They recommended more government support for rural financial systems. Umar and Nwankwo (2024) used Tobit regression and data from the World Bank's Global Findex (2012–2023) to examine financial inclusion proxies and SME growth. They found LADSMSEs and FDI to be strong drivers of SME performance. However, limited access to loans remained a challenge. The study advised the creation of tailored credit policies for SMEs. Obi and Akinyele (2024) utilized Bayesian estimation on 2015–2024 data to study the impact of rural bank loans on SME growth. They found a positive relationship, but high credit costs hindered full benefits. The authors recommended interest rate reduction policies to make loans more affordable for small businesses. Ekanem and Bello (2024) conducted a dynamic panel analysis using data from 2011 to 2023, revealing that financial inclusion indicators such as RBDs and BBS significantly enhance

SME output. They concluded that further improvements in digital banking adoption could amplify these positive effects and recommended broader use of technology in SME financing.

Okello Candiya Bongomin et al. (2025) investigated the relationship between financial inclusion and the sustainability of indigenous MSMEs in Africa, with financial literacy as a key moderating factor, using a semi-structured questionnaire and theoretical grounding in consumer socialisation and social learning theories. The study found a positive relationship, showing that financial inclusion improves MSME sustainability when supported by strong financial literacy, while emphasising the need for better financial education programs to enhance entrepreneurial decision-making. Okello Candiya Bongomin et al. (2024) suggested that the acquisition of knowledge to understand and make better financial judgments can significantly enhance the financial and entrepreneurial skills of MSME owners and managers. Okello Candiya Bongomin et al. (2020) observed that MSME owners and managers, who aim to become confident in managing finances, should be well-informed and equipped with adequate financial knowledge and skills. Financial literacy, when combined with other business skills, becomes necessary for MSME owners and managers to confidently run their businesses. According to Okello Candiya Bongomin et al. (2020a, b, c), financial inclusion is crucial for achieving business objectives and success among MSMEs. Access to finance enables MSMEs to expand, increase output, and create employment opportunities. Recent literature by Anthanasius and Opperman (2023) showed that financial inclusion, through access to formal bank accounts, savings and informal saving mechanisms, can help MSMEs generate returns and ensure sustainability. Saifurrahman and Kassim (2023) revealed that improved credit risk assessment procedures, particularly by Islamic banks, can mitigate issues such as non-repayment and delinquency in lending, thereby increasing the inclusion of MSMEs by Islamic banks. This boosts their performance and earnings, contributing to sustainability.

Damane and Ho (2025) examined the effect of SME financial inclusion on financial stability across 11 Sub-Saharan African countries (2005–2019) using fixed effects and panel quantile regression techniques. The results show that increased SME financial inclusion, proxied by deposits with commercial banks, can undermine financial stability—especially at higher stability levels—supporting the excessive financial inclusion hypothesis and highlighting the need for stronger regulatory safeguards and deposit base diversification. Manasseh et al. (2026) examined the effects of financial inclusion, green bonds, and energy efficiency on economic growth in Asia using panel data from 2000–2023, with institutional quality and global economic uncertainty incorporated as moderating factors through system GMM and FMOLS estimation. The findings reveal that financial inclusion, green bonds, and energy efficiency promote economic growth, although their effectiveness depends on governance quality and critical institutional thresholds, underscoring the need for stronger institutions and stable macroeconomic policies to sustain inclusive growth. Manasseh et al. (2023) examined the effects of digital finance and financial inclusion on economic growth across 19 COMESA member states using panel ARDL analysis of annual data from 1997–2018. The findings indicate that digital financial services and financial inclusion significantly stimulate economic growth, although poor institutional quality and macroeconomic volatility constrain these benefits, emphasising the need for supportive regulatory and governance frameworks.

2.3 Knowledge Gaps

Despite the expanding literature on financial inclusion and MSME performance, important research gaps remain. Existing evidence is largely country specific, with most studies focusing on Nigeria (Sanusi et al., 2026; Ahonkhai et al., 2025; Adamu & Suleiman, 2025), limiting the generalisability of their findings across Africa. Moreover, financial inclusion is frequently measured using isolated indicators such as bank deposits or credit access, while its broader dimensions, including financial literacy, digital finance, ATM penetration, mobile money, and digital card ownership, receive limited attention within a unified analytical framework. Methodologically, most studies rely on static or single estimator approaches, including OLS, ARDL, VAR, and GMM, which are less suited to capturing cross country heterogeneity, dynamic adjustment, and long run relationships. Empirical findings also remain inconclusive, with some studies reporting positive effects (Okonkwo et al., 2024; Ekanem & Bello, 2024) and others documenting weak or unstable outcomes that vary with financial structure and credit conditions (Johnson & Adebayo, 2025; Damane & Ho, 2025), indicating that the diverse institutional and financial environments across African economies remain insufficiently explored.

Another important gap concerns the limited integration of behavioural, institutional, and technological perspectives in explaining MSME growth. Although Okello Candiya Bongomin et al. (2025, 2024, 2020) and Saifurrahman and Kassim (2023) emphasise the importance of financial literacy, most studies continue to view financial inclusion primarily as access to finance rather than the combined influence of access, usage, and financial capability. Similarly, the interaction between traditional banking services and fintech based financial inclusion remains underexamined, while governance, institutional quality, and macroeconomic conditions identified by Manasseh et al. (2023, 2026) are rarely incorporated into MSME studies in Africa. This study addresses these gaps by adopting a multidimensional financial inclusion framework and applying Panel ARDL estimators, including PMG, MG, and DFE, complemented by FMOLS and DOLS robustness estimators, to provide more reliable and policy relevant evidence on sustainable MSME growth across African countries.

3. MATERIALS AND METHODS

3.1 Theoretical Framework

This study is anchored in the financial intermediation theory, which explains how financial systems promote economic development by mobilising savings and allocating financial resources efficiently to productive sectors. As advanced by Gurley and Shaw (1960), McKinnon (1973), Shaw (1973), Levine (1997, 2005), and Beck et al. (2007), the theory argues that well-functioning financial intermediaries reduce transaction costs, alleviate information asymmetry, expand access to credit, and improve the efficiency of capital allocation. In the context of MSMEs in Africa, financial inclusion serves as the operational mechanism through which intermediation translates into enterprise growth, sustainability, and competitiveness. Financial inclusion improves MSME performance by expanding access to formal financial services such as savings, credit, payment systems, and insurance, thereby easing liquidity constraints and enabling productive investment. The functional relationship guiding this study is specified as:

$$MSME_{it} = f(FIL_{it}, NRMA_{it}, NAMO_{it}, FINDEX_{it}, NDA_{it}, ATM_{it}, DCO_{it}) \quad (1)$$

Within this framework, financial literacy enhances entrepreneurs' ability to understand and effectively utilise financial services, improving investment and repayment decisions. Mobile money accounts (NRMA) and agent outlets (NAMO) extend financial access to underserved populations, reducing geographical and infrastructural barriers. Deposit accounts (NDA) strengthen savings mobilisation and creditworthiness, while ATMs and digital card ownership (DCO) improve transaction efficiency, security, and business convenience. The financial inclusion index captures the overall depth and effectiveness of financial system participation. Collectively, these channels improve MSME access to finance, reduce operational costs, and strengthen resilience. This framework posits that deeper financial inclusion enhances MSME growth by strengthening financial intermediation channels that improve access, efficiency, and productive use of financial resources across African economies.

3.2 Nature of Data and Sources

The primary objective of this study is to examine the effects of financial inclusion on the growth and sustainability of micro, small, and medium enterprises (MSMEs) in 10 selected African countries over the period 2000–2025. The study employs annual panel data obtained from the World Bank Global Findex Database, the World Bank Global Financial Development Database, the World Bank SME Finance Database, and the World Development Indicators (WDI). The selection of the study period, sample countries, and variables was guided by data availability and consistency across the selected economies. To comprehensively capture the multidimensional nature of financial inclusion, the study utilizes financial literacy (FIL), the number of registered mobile money accounts per 1,000 adults (NRMA), the number of mobile money agent outlets per 1,000 adults (NAMO), the financial inclusion index (FINDEX), the number of deposit accounts per 1,000 adults (NDA), automated teller machines (ATMs) per 100,000 adults, and digital card ownership (DCO) as the key explanatory variables. The growth and sustainability of MSMEs (MSMEGS) constitute the dependent variable and are measured using the total number of registered MSMEs in each country annually. To minimise omitted variable bias and account for macroeconomic influences on enterprise performance, the study further controls for interest rate (INTR) and

exchange rate (EXR). For clarity and ease of interpretation, Table 1 presents the definitions of all model variables, their measurements, expected a priori signs, and supporting empirical literature.

Table 1: Definition of Variables

Acronym	Definition	Repository Link
SMEgrt	Small and Medium Enterprises Growth	https://data.worldbank.org/indicator/IC.BUS.NREG
SMEL	Small and Medium Enterprise Loans	https://databank.worldbank.org/metadataglossary/g20-financial-inclusion-indicators/series/fin14q2
FIL	Financial Literacy	https://www.worldbank.org/en/publication/globalindex
NRMA	Number of registered mobile money accounts per 1000 adults	https://www.worldbank.org/en/publication/globalindex
NAMO	Number of mobile money agent outlets.	https://www.worldbank.org/en/publication/globalindex
Findex	Financial inclusion index	https://www.worldbank.org/en/publication/globalindex
NDA	Number of deposit accounts per 1000 adults	https://www.worldbank.org/en/publication/globalindex
ATM	Automated teller machine per 10000 adults	https://data.worldbank.org/indicator/FB.ATM.TOTL.P5
DCO	Digital card ownership.	https://www.worldbank.org/en/publication/globalindex
INTR	Interest Rate	https://data.worldbank.org/indicator/FR.INR.RINR
EXR	Exchange Rate	https://data.worldbank.org/indicator/PA.NUS.FCRF

Source: Authors' Concept. Countries Selected: Burundi, Benin, Burkina Faso, Botswana, Côte d'Ivoire, Comoros, Cabo Verde, Ghana, Nigeria, and Rwanda.

3.3 Econometric Modelling

3.3.1 Baseline Autoregressive Distributed Lag (ARDL) Model

This study investigates the effect of financial inclusion on the sustainable growth of Micro, Small and Medium Enterprises (MSMEs) in selected African countries using a comprehensive panel econometric framework that combines both dynamic heterogeneous panel estimation techniques and robustness cointegration approaches. To capture the complex and potentially heterogeneous relationships across countries, the study employs the Panel Autoregressive Distributed Lag (PARDL) model estimated through the Mean Group (MG), Pooled Mean Group (PMG), and Dynamic Fixed Effects (DFE) estimators. In addition, the robustness of the results is validated using Panel Fully Modified Ordinary Least Squares (FMOLS) and Panel Dynamic Ordinary Least Squares (DOLS) estimators. The MG estimator, developed by Pesaran and Smith (1995), allows full heterogeneity in both short-run and long-run coefficients across countries by estimating separate regressions for each cross-sectional unit and then averaging the coefficients. On the other hand, the PMG and DFE estimators, proposed by Pesaran, Shin, and Smith (1999), introduce varying degrees of parameter restriction. The PMG estimator is particularly relevant in this context because it imposes homogeneity on long-run coefficients across countries while allowing short-run dynamics, adjustment speeds, and error variances to differ. This makes it suitable for African economies where structural differences may exist in the short run, but long-run equilibrium relationships may converge due to shared institutional and financial development trends.

The PMG estimator operates under specific assumptions. It assumes that the error terms are serially uncorrelated and independent of the regressors, implying weak exogeneity of explanatory variables. It further assumes the existence of a stable long-run equilibrium relationship among the variables and imposes homogeneity on long-run slope coefficients across countries while permitting heterogeneity in short-run dynamics. This flexibility allows the model to capture both convergence in long-run behaviour and divergence in short-run adjustments across African economies. In comparison, the DFE estimator imposes a stronger restriction by assuming homogeneity in both slope coefficients and long-run relationships while only allowing intercepts to vary across

countries. The MG estimator, by contrast, does not impose any homogeneity restriction and therefore provides a useful benchmark for comparison. Following Pesaran et al. (1999), the general panel ARDL ($p, q, q, \dots, q$) specification adopted in this study is expressed as:

$$MSME_{it} = \sum_{j=1}^p \phi_{ij} MSME_{i,t-j} + \sum_{j=0}^q \beta'_{ij} FIN_{i,t-j} + \mu_i + \varepsilon_{it} \quad (2)$$

In this specification, $MSME_{it}$ represents the measures of MSME growth for country i at time t , while FIN_{it} denotes a vector of financial inclusion and macroeconomic explanatory variables. The parameters ϕ_{ij} capture the lagged effects of MSME growth, whereas β_{ij} represent the short-run dynamic coefficients associated with the explanatory variables. The term μ_i captures unobserved country-specific effects, and ε_{it} represents the idiosyncratic error term assumed to be white noise. The subscripts $i = 1, 2, \dots, N$ and $t = 1, 2, \dots, T$ denote the cross-sectional and time dimensions of the panel, respectively. For estimation purposes, the above ARDL model is re-parameterised into an error correction representation that separates long-run equilibrium relationships from short-run dynamics. The resulting specification is given as:

$$\Delta MSME_{it} = \varphi_i (MSME_{i,t-1} - \theta'_i FIN_{it}) + \sum_{j=1}^{p-1} \lambda_{ij} \Delta MSME_{i,t-j} + \sum_{j=0}^{q-1} \delta'_{ij} \Delta FIN_{i,t-j} + \mu_i + \varepsilon_{it} \quad (3)$$

In this formulation, the operator Δ denotes first differences, while φ_i represents the error correction coefficient that measures the speed at which deviations from long-run equilibrium are corrected. The vector θ_i captures the long-run coefficients, whereas λ_{ij} and δ_{ij} represent short-run dynamic effects of the dependent and explanatory variables, respectively. A negative and statistically significant value of φ_i confirms the existence of a stable long-run relationship and indicates that any short-run disequilibrium is corrected over time. In comparing the MG, PMG, and DFE estimators, it is important to emphasise that each estimator is based on different assumptions regarding parameter homogeneity. The MG estimator allows complete heterogeneity across countries by estimating separate regressions and averaging the long-run coefficients. The PMG estimator, however, restricts long-run coefficients to be identical across countries while allowing short-run coefficients and adjustment dynamics to vary. The DFE estimator imposes the most restrictive assumption by assuming homogeneity in both short-run and long-run slopes while allowing only intercepts to differ across countries. Consequently, the choice between these estimators becomes an empirical issue. To determine the most appropriate estimator, this study employs a Hausman-type specification test that compares the PMG and MG estimators. The null hypothesis supports the PMG estimator, implying that long-run homogeneity holds and PMG is efficient and consistent. Rejection of the null hypothesis indicates that the MG estimator is more appropriate due to the violation of long-run homogeneity assumptions. Building on this framework, the empirical ARDL model is specified to incorporate financial inclusion and MSME growth indicators as follows:

$$MSME_{it} = \alpha_i + \sum_{j=1}^p \beta_{1j} MSME_{i,t-j} + \sum_{j=0}^q \beta_{2j} FINDEX_{i,t-j} + \sum_{j=0}^q \beta_{3j} FIL_{i,t-j} + \sum_{j=0}^q \beta_{4j} NRMA_{i,t-j} + \sum_{j=0}^q \beta_{5j} NDA_{i,t-j} + \sum_{j=0}^q \beta_{6j} ATM_{i,t-j} + \sum_{j=0}^q \beta_{7j} NAMO_{i,t-j} + \sum_{j=0}^q \beta_{8j} DCO_{i,t-j} + \sum_{j=0}^q \beta_{9j} INTR_{i,t-j} + \sum_{j=0}^q \beta_{10j} EXR_{i,t-j} + \varepsilon_{it} \quad (4)$$

In this extended specification, MSME growth is proxied by indicators such as the number of registered MSMEs and MSME loan access. The financial inclusion index captures overall access to and usage of financial services, while financial literacy reflects the level of financial knowledge among economic agents. Other variables include the number of registered mobile money accounts per 1,000 adults, deposit account ownership per 1,000 adults, automated teller machines per 100,000 adults, mobile money agent outlets per 1,000 adults, digital card ownership, interest rate, and exchange rate. All variables are transformed into natural logarithms to ensure elasticity interpretation and to reduce potential heteroskedasticity issues. The error term captures all unobserved shocks and is assumed to be independently and identically distributed.

To examine the existence of a long-run relationship among the variables, the study applies the bounds testing approach to cointegration based on the F-statistic. The null hypothesis of no long-run relationship is tested against the alternative hypothesis of cointegration among the variables. The decision rule follows established critical values provided by Pesaran et al. (1999) and Narayan (2004). If the computed F-statistic exceeds the upper bound critical value, the null hypothesis is rejected, confirming the existence of a long-run relationship. If the F-statistic falls below the lower bound, the null hypothesis cannot be rejected, indicating no cointegration. However, if the F-statistic lies between the lower and upper bounds, the result is deemed inconclusive. Once cointegration is established, the study proceeds to estimate both long-run and short-run dynamics using an error correction model of the form:

$$\Delta MSME_{it} = \gamma_i + \sum \lambda \Delta X_{it} + \psi ECT_{i,t-1} + \varepsilon_{it} \quad (5)$$

In this specification, $ECT_{i,t-1}$ represents the lagged error correction term derived from the long-run equilibrium relationship, while ψ measures the speed of adjustment back to equilibrium. A negative and statistically significant value of ψ confirms convergence toward long-run equilibrium following short-run disturbances, thereby validating the stability of the estimated relationships.

3.3.2 Robustness Checks: Panel FMOLS and Panel DOLS Estimators

Given that the Autoregressive Distributed Lag (ARDL) framework, while suitable for capturing dynamic short-run and long-run relationships, does not fully address potential endogeneity, serial correlation, and small-sample bias issues, this study further employs Panel Fully Modified Ordinary Least Squares (FMOLS) and Panel Dynamic Ordinary Least Squares (DOLS) as robustness checks. These estimators are widely recognized for their ability to produce consistent and efficient long-run parameter estimates in the presence of cointegration among variables. The Panel DOLS estimator is a parametric correction technique designed to eliminate endogeneity and serial correlation by augmenting the cointegration regression with leads and lags of the first-differenced regressors. By incorporating these dynamic terms, the estimator effectively corrects for feedback effects between explanatory variables and the error term, thereby ensuring unbiased long-run estimates. The baseline panel DOLS model can be expressed as

$$MSME_{it} = \alpha_i + \beta'_i X_{it} + \sum_{j=-p}^q \gamma_{ij} \Delta X_{i,t-j} + \varepsilon_{it} \quad (6)$$

Where $MSME_{it}$ denotes MSME growth, X_{it} represents the vector of explanatory variables capturing financial inclusion and macroeconomic indicators, α_i captures country-specific fixed effects, and ε_{it} is the disturbance term. The terms $\Delta X_{i,t-j}$ represent the leads and lags of the first-differenced regressors, which are included to correct for simultaneity bias and serial correlation. The integers p and q denote the number of lagged and lead terms included in the specification. The long-run Panel DOLS estimator is obtained by averaging the individual country-specific cointegration coefficients. This is commonly referred to as the group-mean Panel DOLS estimator and is defined as:

$$\hat{\beta}_{DOLS}^{GM} = \frac{1}{N} \sum_{i=1}^N \hat{\beta}_i \quad (7)$$

Where $\hat{\beta}_i$ represents the estimated long-run coefficient from the DOLS regression for each cross-sectional unit. To assess the overall statistical significance of the estimated long-run parameters, the group-mean t-statistic is computed as:

$$t_{\beta}^{GM} = \frac{1}{N} \sum_{i=1}^N t_{\hat{\beta}_i} \quad (8)$$

Where $t_{\hat{\beta}_i}$ denotes the individual t-statistics from each country-specific DOLS estimation. In contrast, the Panel FMOLS estimator is a semi-parametric approach that corrects for both endogeneity and serial correlation by applying a non-parametric adjustment to the residuals of the cointegration equation. This adjustment is based on

the long-run covariance matrix of the residual process, ensuring that the estimator remains asymptotically unbiased and efficient in the presence of heterogeneous serial correlation structures across countries. The FMOLS long-run relationship for the panel can be specified as:

$$MSME_{it} = \alpha_i + \beta_i' X_{it} + u_{it} \quad (9)$$

Where u_{it} is the equilibrium error term, assumed to be stationary but potentially correlated with the regressors. To correct for this correlation, the FMOLS estimator modifies the OLS estimator using leads, lags, and long-run covariance adjustments. The pooled Panel FMOLS estimator is expressed as:

$$\hat{\beta}_{FMOLS} = \left(\sum_{i=1}^N \sum_{t=1}^T (X_{it} - \bar{X}_i)(X_{it} - \bar{X}_i)' \right)^{-1} \left(\sum_{i=1}^N \sum_{t=1}^T (X_{it} - \bar{X}_i) \widetilde{MSME}_{it} \right) \quad (10)$$

Where $\widetilde{MSME}_{it}$ represents the bias-corrected dependent variable adjusted for endogeneity and serial correlation, and $\bar{X}_i$ denotes the country-specific mean of the regressors. The correction mechanism is based on the estimation of the long-run covariance matrix Ω_i , which can be decomposed as:

$$\Omega_i = \Gamma_i(0) + \sum_{j=1}^{\infty} [\Gamma_i(j) + \Gamma_i(j)'] \quad (11)$$

Where $\Gamma_i(0)$ is the contemporaneous covariance matrix, and the summation term captures the weighted sum of autocovariances. The lower triangular matrix obtained from the Cholesky decomposition of Ω_i is used to transform the residuals and eliminate endogeneity bias. Both FMOLS and DOLS estimators serve as important robustness checks in this study. While Panel DOLS explicitly corrects for endogeneity through the inclusion of leads and lags of differenced regressors in a parametric framework, Panel FMOLS achieves similar objectives through a semi-parametric correction of the long-run covariance structure. The consistency of results across ARDL, FMOLS, and DOLS estimators therefore provides strong evidence of the robustness and reliability of the estimated long-run relationships between financial inclusion and MSME growth in selected African countries.

4. PRESENTATION OF EMPIRICAL RESULTS AND DISCUSSION OF FINDINGS

The primary objective of this study is to examine the effect of financial inclusion on the growth and sustainability of micro, small and medium enterprises (MSMEs) in selected African countries. This relationship is analysed within a dynamic panel econometric framework, primarily using the Autoregressive Distributed Lag (ARDL) model to capture both short-run adjustments and long-run equilibrium relationships among the variables. To ensure the robustness and reliability of the empirical results, all variables are subjected to standard econometric pre-estimation procedures. These include descriptive statistics to summarise the distributional properties of the data and correlation analysis to assess the degree of association among financial inclusion indicators and MSME growth. In addition, unit root tests such as the Levin–Lin–Chu (LLC), Im–Pesaran–Shin (IPS), Augmented Dickey–Fuller (ADF), and Phillips–Perron (PP) tests are employed to determine the order of integration of the variables and to confirm the appropriateness of the ARDL framework, which accommodates variables integrated of order I(0) and I(1). Following this, the ARDL bounds testing approach is used to establish the existence of a long-run cointegrating relationship between MSME growth and financial inclusion indicators. To further validate the empirical findings, several post-estimation diagnostic tests are conducted, including tests for normality, serial correlation, heteroscedasticity, and model specification using the Ramsey RESET test. These diagnostic procedures ensure that the estimated model satisfies classical econometric assumptions and help to minimise the risk of biased or spurious results. The subsequent section provides a detailed description of the data sources, variable construction, and measurement of all study variables.

4.1 Data Description

In Table 2 below, a summary of the descriptive statistics and Spearman's correlation matrix for the study variables is presented. The descriptive statistics provide an overview of the central tendency and dispersion of the variables

capturing financial inclusion and MSME growth across selected African countries. The results indicate observable variation across the dataset, reflecting differences in levels of financial inclusion and MSME performance across countries and over time. Specifically, the minimum and maximum values show substantial heterogeneity in the series, suggesting the presence of diverse financial development conditions within the sampled economies. The mean, median, standard deviation, skewness, and kurtosis values are relatively close across variables, indicating a generally stable distributional pattern. In addition, the Jarque–Bera statistics confirm that most of the variables are normally distributed, as their probability values are statistically significant, thereby supporting the suitability of parametric econometric estimation techniques. Furthermore, the Spearman’s correlation results, as reported in Table 3, reveal meaningful relationships among the variables. There exists a strong positive correlation between MSME growth and key financial inclusion indicators, including the financial inclusion index (FINDEX), number of registered mobile money accounts per 1,000 adults (NRMA), number of deposit accounts per 1,000 adults (NDA), automated teller machines per 100,000 adults (ATM), number of mobile money agent outlets (NAMO), and digital card ownership (DCO). This suggests that improvements in financial access and digital financial infrastructure are associated with enhanced MSME performance in Africa. Conversely, financial literacy (FIL) and interest rate (INTR) exhibit a negative correlation with MSME growth, implying that higher borrowing costs and potential inefficiencies in financial knowledge dissemination may constrain enterprise expansion within the region.

Table 2: Summary of Descriptive Statistics and Correlation Matrix

Variable	SMEgr t	SME L	FINDE X	FIL	NRM A	NDA	NAM O	AT M	DCO	INT R	EXR
Mean	3.640	2.732	-0.114	3.27 3	0.783	5.27 3	0.612	2.09 9	3.31 4	4.13 5	0.12 8
Median	3.712	2.584	-0.996	3.20 9	0.986	5.25 6	0.808	2.41 5	3.25 3	4.31 0	0.09 1
Max	4.225	6.879	2.287	4.65 0	2.620	7.68 3	3.045	6.57 1	4.65 0	5.40 5	1.27 8
Mini	2.920	- 0.134	-3.368	1.65 0	-6.350	2.02 7	-3.177	- 5.162	1.65 0	3.06 7	- 0.140
Std. Dev.	0.304	1.322	0.970	0.52 7	1.084	1.25 6	0.991	2.35 8	0.53 4	0.64 1	0.17 6
Skew	-0.306	0.958	0.163	0.42 5	-2.416	- 0.184	-0.969	- 0.863	0.24 2	0.03 7	3.52 0
Kurtosi s	2.279	4.191	2.998	3.85 2	14.62	2.63 6	5.029	3.79 6	3.81 1	1.74 3	18.5 1
J-B	7.835	44.55	0.807	12.4 6	1.042	1.68 5	56.76	31.6 4	7.17 8	13.8 6	25.9 7
Proby	0.019	0.000	0.027	0.96 8	0.000	0.03 0	0.000	0.00 0	0.02 7	0.00 7	0.00 0
Sum	764.5	573.8	-1.294	674. 2	13.82	7.96 2	6.028	44.8 6	639. 6	868. 4	27.0 7
Obs..	210	210	182	206	158	151	173	210	193	210	210
SMEgrt	1										
SMEL	0.926	1									
FINDE X	0.483	- 0.986	1								
FIL	-0.945	- 0.831	0.897	1							

NRMA	0.970	-0.849	-0.826	-0.443	1						
NDA	0.693	-0.081	0.332	-0.403	-0.675	1					
ATM	0.613	-0.868	0.443	0.555	0.555	-0.305	1				
NAMO	0.890	-0.325	-0.975	-0.813	0.426	0.595	-0.108	1			
DCO	0.369	-0.117	0.910	0.786	0.282	-0.142	-0.671	0.178	1		
INTR	-0.568	-0.355	-0.568	0.921	0.684	0.581	0.182	0.638	-0.130	1	
EXR	0.658	-0.755	0.473	0.891	0.118	-0.112	-0.833	0.662	0.348	-0.356	1

Source: Author's Concept

4.2 Unit Root

Time series and panel data, if not properly treated, may produce spurious regression results. To address this concern, this study conducts panel unit root tests to determine the stationarity properties of the variables and avoid misleading inferences, following established empirical practices. In line with prior studies (e.g., Manasseh et al., 2019), the study applies a combination of first- and second-generation panel unit root tests, including the Levin, Lin, and Chu (LLC, 2002), Im, Pesaran, and Shin (IPS, 2003), as well as the Fisher-type Augmented Dickey–Fuller (ADF) and Fisher-type Phillips–Perron (PP) tests proposed by Maddala and Wu (1999). The LLC test assumes a common unit root process across all cross-sections, implying homogeneity in the persistence of shocks, while the IPS, Fisher-ADF, and Fisher-PP tests allow for heterogeneity by permitting individual unit root processes across countries. This distinction is particularly important in the context of African economies, where financial inclusion and MSME growth are expected to exhibit varying dynamics due to differences in institutional quality, financial development, and economic structure. The purpose of applying these complementary unit root tests is to determine the order of integration of each variable, thereby confirming whether they are stationary at levels $I(0)$ or after first differencing $I(1)$. Establishing the stationarity properties of the variables is a necessary precondition for the validity of the panel ARDL modelling framework employed in this study. The detailed results of the unit root tests are presented in Table 3.

The null hypothesis for the panel unit root tests states that the variables contain a unit root (i.e., are non-stationary), while the alternative hypothesis assumes that the variables are stationary. The decision rule is that the null hypothesis is rejected when the p-value is less than 0.05. The results from the Levin, Lin, and Chu (LLC), Im, Pesaran and Shin (IPS), Fisher-ADF, and Fisher-PP tests indicate that the null hypothesis of a unit root is rejected for all variables, as their respective p-values are statistically significant at the 5 percent level. This provides strong evidence that the variables are stationary either at level or after first differencing. Further examination reveals a mixed order of integration among the variables, with some being integrated at level $I(0)$ while others become stationary after first differencing $I(1)$. Importantly, none of the variables are integrated of order $I(2)$ or higher. This mixed integration order validates the suitability of the panel ARDL approach adopted in this study, as it is designed to accommodate variables that are a combination of $I(0)$ and $I(1)$. Consequently, the findings confirm that the dataset satisfies the underlying assumptions required for reliable estimation and inference within the ARDL framework, thereby ensuring that the estimated relationships between financial inclusion and MSME growth are not spurious.

Table 3: Summary of Results of Stationarity Tests

Variable	LLC	IPS	Fisher-ADF	Fisher-PP	Integration Order	
					Level	First Diff.
SMEgrt	-13.16*** (0.000)	-10.72*** (0.000)	127.2*** (0.000)	133.3*** (0.000)	—	I(1)
SMEL	-10.49*** (0.000)	-9.106*** (0.000)	107.5*** (0.000)	119.1*** (0.000)	—	I(1)
FINDEX	-23.74*** (0.000)	-14.52*** (0.000)	92.49*** (0.000)	105.1*** (0.000)	—	I(1)
FIL	-16.13*** (0.000)	-12.14*** (0.000)	188.2*** (0.000)	198.9*** (0.000)	—	I(1)
NRMA	-7.556*** (0.000)	-7.002*** (0.000)	84.94*** (0.000)	84.26*** (0.000)	I(1)	—
NDA	-3.977*** (0.000)	-5.47*** (0.000)	73.62*** (0.000)	320.1*** (0.000)	—	I(1)
ATM	-9.315*** (0.000)	-6.968*** (0.000)	92.03*** (0.000)	94.36*** (0.000)	—	I(1)
NAMO	-6.327*** (0.000)	-8.229*** (0.000)	10.07*** (0.000)	112.3*** (0.000)	I(0)	—
DCO	-9.220*** (0.000)	-7.059*** (0.000)	82.11*** (0.000)	94.82*** (0.000)	—	I(1)
INTR	-3.710*** (0.001)	-2.987*** (0.001)	40.61*** (0.004)	38.86** (0.006)	I(0)	—
EXR	-5.691*** (0.000)	-4.728*** (0.000)	56.03*** (0.000)	54.84*** (0.000)	I(0)	—

Source: Authors' Concept. (.) represents the probability value; ***, **, and * represent 1%, 5%, and 10% significant levels.

4.3 Testing for Cointegration

After establishing the stationarity properties and order of integration of the variables, the study further examined the existence of a long-run equilibrium relationship between financial inclusion and MSME growth in Africa through panel cointegration analysis. This was achieved using the Pedroni (2003) cointegration test as the primary approach, while the Kao (1999) cointegration test was employed as a robustness check to validate the consistency of the results. For analytical clarity, the cointegration tests were conducted separately for MSME growth (SMEgrt) and financial inclusion, as well as for SME loan (SMEL) and financial inclusion, with the results reported in Table 5. The null hypothesis for both tests assumes “no cointegration,” and the decision rule is to reject the null hypothesis when the probability values are less than 0.05. Empirical results from the Pedroni test indicate that the null hypothesis is rejected in most of the test statistics, as the majority of the probability values are below the 5 per cent significance level for both models, suggesting evidence of a stable long-run relationship between financial inclusion and MSME growth indicators. This finding is further confirmed by the Kao (1999) cointegration test, which also rejects the null hypothesis of no cointegration. Consequently, the study concludes that a long-run equilibrium relationship exists between financial inclusion and the growth of micro, small, and medium enterprises in Africa.

Table 4: Summary of Pedroni and Kao Cointegration Results

Tests	Panel- v	Panel- rho	Panel- PP	Panel- ADF	Group- rho	Group- PP	Group- ADF	Kao test (Robustness Check)
SMEgrt and Financial Inclusion	0.693 (0.244)	-0.678 (0.248)	- 10.60*** (0.000)	- 10.42*** (0.000)	0.863*** (0.000)	- 10.55*** (0.000)	- 11.16*** (0.000)	-4.931*** (0.000)
SMEL and Financial Inclusion	1.611 (0.053)	-1.207 (0.113)	- 26.19*** (0.000)	- 16.83*** (0.000)	2.162** (0.014)	- 8.143*** (0.000)	- 7.226*** (0.000)	-4.589*** (0.000)

Source: Authors' Concept. (.) represents the probability value; ***, **, and * represent 1%, 5%, and 10% significant levels.

4.4 Baseline Autoregressive Distributed Lag (ARDL) Model

The choice of the panel Autoregressive Distributed Lag (ARDL) framework, particularly the Mean Group (MG), Pooled Mean Group (PMG), and Dynamic Fixed Effects (DFE) estimators, is appropriate for this study because it effectively captures both the short-run dynamics and long-run equilibrium relationship between financial inclusion and MSME growth across heterogeneous African economies. Unlike conventional static panel estimators such as fixed effects (FE), random effects (RE), or pooled ordinary least squares (POLS), the panel ARDL approach accommodates variables integrated of mixed orders, $I(0)$ and $I(1)$, without requiring all variables to be integrated at the same level, provided none is $I(2)$ (Pesaran et al., 1999). The PMG estimator is particularly advantageous because it allows short-run coefficients, error variances, and adjustment speeds to differ across countries while imposing homogeneity only on the long-run coefficients, making it suitable for countries that share common long-run relationships but exhibit heterogeneous short-run adjustments. Conversely, the MG estimator allows complete heterogeneity across countries, while the DFE estimator assumes homogeneous slope coefficients with country-specific fixed effects, providing useful benchmarks for comparison (Pesaran & Smith, 1995; Pesaran et al., 1999). Collectively, these estimators account for cross-country heterogeneity, dynamic adjustment processes, and long-run cointegration, producing more efficient, consistent, and policy-relevant estimates than traditional static panel models.

4.4.1 Financial Inclusion and Growth of Micro, Small and Medium Enterprises in Africa

The baseline panel ARDL estimates reported in Table 5 reveal substantial evidence of both short-run persistence and long-run relationships between financial inclusion and MSME growth across the selected African countries. Across all specifications, the lagged dependent variable is positive and statistically significant, particularly under the MG and DFE estimators, indicating strong persistence in MSME growth and suggesting that previous enterprise performance significantly influences current growth outcomes. The error correction term (ECM) is consistently negative and statistically significant across the MG, DFE, and PMG estimators, confirming the existence of a stable long-run equilibrium relationship between financial inclusion indicators and MSME growth. The magnitude of the adjustment coefficients indicates that between approximately 4.2% and 95.6% of short-run disequilibria are corrected annually depending on the specification, implying rapid convergence toward long-run equilibrium following temporary shocks. The Hausman statistics further indicate that the PMG estimator is preferred in Models 1, 4, 5 and 7 because the null hypothesis of long-run homogeneity cannot be rejected ($p > 0.05$), whereas the MG estimator is more appropriate for Models 2, 3 and 6 where significant Hausman statistics suggest heterogeneous long-run coefficients across countries. Regarding the explanatory variables, the composite financial inclusion index (Findex) exhibits mixed effects across estimators, with predominantly negative coefficients under MG, DFE and PMG specifications, suggesting that aggregate financial inclusion alone may not automatically translate into MSME growth unless accompanied by effective utilisation of financial services and supportive institutional frameworks. This finding partially corroborates the observations of Damane and Ho (2025), who argued that excessive financial inclusion may generate unintended distortions, but contrasts with the

positive effects reported by Sanusi et al. (2026), Manasseh et al. (2023) and Anthanasius and Opperman (2023), who found that improved financial inclusion significantly enhances enterprise performance and sustainability. Examining the individual dimensions of financial inclusion provides richer insights into the channels through which MSMEs benefit from financial development. Financial literacy (FIL) exerts a consistently positive and statistically significant effect across almost all specifications, demonstrating that financially knowledgeable entrepreneurs are more capable of mobilising resources, evaluating investment opportunities, managing business risks and improving enterprise sustainability. This outcome strongly supports the findings of Okello Candiya Bongomin et al. (2025, 2024, 2020a, 2020b, 2020c), who emphasised financial literacy as the foundation for effective utilisation of financial services. Likewise, digital financial inclusion variables, including registered mobile money accounts (NRMA), mobile money agent outlets (NAMO), ATM penetration and digital card ownership (DCO), which display predominantly positive long-run effects under the preferred PMG specifications, indicating that digital financial infrastructure substantially improves MSME growth by lowering transaction costs, expanding access to financial services and facilitating business operations. The positive influence of deposit accounts (NDA) in several specifications further highlights the importance of formal savings mobilisation in expanding enterprise financing, although the occasional negative coefficients suggest that inactive accounts or inefficient credit intermediation may weaken their effectiveness. Exchange rate generally promotes MSME growth, while interest rate demonstrates mixed effects, implying that favourable macroeconomic conditions remain essential for maximising the gains from financial inclusion. These findings support the conclusions of Manasseh et al. (2026), Ahonkhai et al. (2025), Ekanem and Bello (2024), Umar and Nwankwo (2024), Hassan and Yusuf (2025), and Bello and Olatunji (2025), who argued that financial inclusion yields stronger enterprise growth when supported by financial literacy, digital financial infrastructure, efficient financial intermediation, and a stable macroeconomic environment.

Table 5: Estimated ARDL Results

1	Model	SME grt (-1)	Finde x	INT R	EXR	FIL	NRM A	NDA	ATM	NA MO	DCO	Haus man	ECM (-1)
	MG	0.890 *** (0.000)	- 0.974 *** (0.000)	0.751 ** (0.0354)	0.902 *** (0.000)	-	-	-	-	-	-	-	- 0.917 *** (0.000)
	DFE	0.907 *** (0.000)	- 0.894 *** (0.000)	0.951 ** (0.014)	9.602 *** (0.009)	-	-	-	-	-	-	-	- 0.109 ** (0.012)
	PMG	- 15.88 *** (0.000)	- 17.19 *** {0.000}	7.283 (0.1990)	34.62 *** (0.029)	-	-	-	-	-	-	8.565 612 (0.2854)	- 0.138 *** (0.006)
2	MG	0.885 *** (0.000)	- 0.572 *** (0.000)	0.882 *** (0.000)	1.034 *** (0.000)	0.922 *** (0.000)	-	-	-	-	-	-	- 0.887 *** (0.000)
	DFE	0.818 ***	- 0.959 ***	- 1.231 ***	8.894 ***	0.918 ***	-	-	-	-	-	-	- 0.181 ***

		(0.00 0)	(0.00 0)	(0.00 0)	(0.00 0)	(0.000)							(0.00 0)
	PM G	0.568 *** (0.00 0)	0.849 *** (0.00 0)	0.799 *** (0.00 0)	- 1.252 *** (0.00 0)	0.013 *** (0.006)	-	-	-	-	-	13.84 2855 (0.016 6)	- 0.160 ** (0.03 9)
3	M G	0.891 *** (0.00 0)	0.765 *** (0.00 0)	0.897 *** (0.00 0)	9.396 *** (0.00 9)	0.020 ** (0.032)	- 0.914 *** (0.00 0)	-	-	-	-	-	- 1.081 *** (0.00 0)
	DF E	0.892 *** (0.00 0)	- 0.034 *** (0.00 0)	0.886 *** (0.00 0)	1.320 *** (0.00 0)	0.020 *** (0.001)	- 0.121 *** (0.00 0)	-	-	-	-	-	- 0.107 *** (0.00 4)
	PM G	0.027 *** (0.00 0)	- 0.104 ** (0.02 4)	1.449 (0.05 2)	0.292 ** (0.03 7)	0.040 ** (0.029)	0.030 *** (0.00 0)	-	-	-	-	14.50 8381 (0.024 4)	- 0.208 *** (0.00 0)
4	M G	0.875 *** (0.00 0)	- 0.461 *** (0.00 0)	0.725 *** (0.00 0)	0.018 ** (0.03 5)	0.032 *** (0.005)	- 0.094 *** (0.00 0)	0.032 *** (0.00 0)	-	-	-	-	- 0.840 *** (0.00 0)
	DF E	0.878 *** (0.00 0)	- 0.479 *** (0.00 0)	0.739 *** (0.00 0)	1.859 *** (0.00 0)	0.932 *** (0.000)	- 0.489 *** (0.00 0)	0.027 *** (0.00 0)	-	-	-	-	- 0.121 *** (0.00 4)
	PM G	0.036 *** (0.00 0)	- 0.184 *** (0.00 0)	0.532 *** (0.00 0)	0.328 *** (0.00 7)	0.013 *** (0.006)	0.084 *** (0.00 0)	0.076 *** (0.00 0)	-	-	-	10.94 1369 (0.141 2)	- 0.942 *** (0.00 0)
5	M G	16.72 *** (0.00 0)	- 0.381 *** (0.00 0)	- 5.475 *** (0.00 0)	9.697 *** (0.00 0)	0.025 *** (0.000)	0.053 *** (0.00 0)	0.047 ** (0.01 7)	0.088 *** (0.00 0)	-	-	-	- 0.094 *** (0.00 1)
	DF E	0.784 *** (0.00 0)	- 0.515 *** (0.00 0)	- 6.029 *** (0.00 0)	0.343 *** (0.00 0)	0.076 *** (0.000)	- 0.440 *** (0.00 9)	7.024 *** (0.00 0)	5.225 *** (0.00 0)	-	-	-	- 0.193 *** (0.00 2)
	PM G	0.022 *** (0.00 0)	- 0.081 *** (0.00 0)	1.327 *** (0.00 0)	0.559 *** (0.00 0)	0.012 3*** (0.000)	1.518 *** (0.00 0)	- 2.115 (0.29 4)	0.050 *** (0.00 3)	-	-	11.31 9414 (0.184 2)	- 0.281 *** (0.00 0)

			(0.00 0)										(0.00 0)
6	M G	0.878 *** (0.00 0)	- 0.462 *** (0.00 0)	0.616 *** (0.00 0)	11.16 *** (0.00 0)	0.034 *** (0.004)	- 0.094 *** (0.00 0)	0.092 *** (0.00 0)	0.739 *** (0.00 0)	0.290 ** (0.01 5)	—	—	- 0.862 *** (0.00 0)
	DF E	0.784 *** (0.00 0)	- 0.013 ** (0.02 5)	- 0.032 *** (0.00 0)	- 0.915 *** (0.00 0)	0.747 (0.225)	- 0.017 (0.59 4)	6.475 ** (0.02 6)	30.38 *** (0.00 0)	0.013 ** (0.01 4)	—	—	- 0.215 *** (0.00 1)
	PM G	0.038 *** (0.00 0)	- 0.061 1** (0.01 5)	0.452 *** (0.00 0)	0.372 *** (0.00 1)	0.149 *** (0.000)	0.179 *** (0.00 0)	- 0.788 *** (0.00 8)	0.761 *** (0.00 2)	0.047 * (0.04 4)	—	20.27 3601 (0.016 3)	- 0.956 *** (0.00 0)
7	M G	0.823 *** (0.00 0)	- 0.609 *** (0.00 0)	0.602 *** (0.00 0)	- 1.202 *** (0.00 0)	5.030 *** (0.000)	- 0.151 ** (0.02 5)	0.028 *** (0.00 6)	0.086 *** (0.00 0)	0.213 *** (0.00 0)	0.091 *** (0.00 9)	—	- 0.801 *** (0.00 0)
	DF E	0.823 *** (0.00 0)	- 0.079 *** (0.00 0)	0.023 *** (0.00 0)	- 0.102 *** (0.00 0)	9.030 *** (0.000)	- 0.151 *** (0.00 0)	0.328 (0.23 5)	0.078 *** (0.00 0)	0.213 *** (0.00 0)	0.991 *** (0.00 0)	—	- 0.177 *** (0.00 3)
	PM G	0.024 *** (0.00 0)	- 0.104 ** (0.02 4)	1.448 (0.05 2)	0.292 ** (0.03 7)	0.041 ** (0.029)	- 0.040 1** (0.00 0)	0.072 *** (0.00 0)	0.019 *** (0.03 2)	0.319 (0.74 6)	0.767 (0.15 1)	3.532 895 (0.966 0)	- 0.042 *** (0.00 0)

Source: Authors' Concept: (.) represents P-value; ***, ** and * represent 1%, 5% and 10% levels of significance, and the decision was taken based on the 5% critical level.

4.4.2 Effects of Financial Inclusion on Micro, Small and Medium Enterprises Loan in Africa

The results presented in Table 6 provide strong evidence that financial inclusion significantly influences SME loan performance across the selected African countries, although the magnitude and direction of the effects differ across the MG, DFE, and PMG estimators. The lagged dependent variable is positive and statistically significant in almost all specifications, confirming the persistence of SME lending over time and implying that previous lending performance strongly determines current credit expansion. More importantly, the error correction term (ECM) is consistently negative and highly significant across all models, with coefficients ranging from -0.048 to -1.497 , indicating the existence of a stable long-run equilibrium relationship between SME loans and the financial inclusion variables. This suggests that short-run deviations from equilibrium are corrected rapidly, thereby validating the suitability of the panel ARDL framework. The Hausman statistics indicate that the PMG estimator is preferred for Models 1–4 and 7 because the null hypothesis of long-run homogeneity cannot be rejected, whereas Models 5 and 6 favour the MG estimator due to significant cross-country heterogeneity in the long-run coefficients. Focusing on the preferred estimators, the financial inclusion index (Findex) exhibits mixed outcomes. While it positively influences SME loans in Models 1–3, it becomes negative in Models 4–7, implying that expanding financial access alone does not automatically translate into increased SME credit unless accompanied

by efficient financial intermediation and sound institutional arrangements. This outcome is consistent with the excessive financial inclusion argument advanced by Damane and Ho (2025), but contrasts with the positive evidence reported by Sanusi et al. (2026), Anthanasius and Opperman (2023), and Manasseh et al. (2023), who found that improved financial inclusion generally enhances enterprise financing and performance.

The disaggregated indicators of financial inclusion provide deeper insights into the channels through which SME lending responds to financial sector development in Africa. Financial literacy (FIL) maintains a positive and statistically significant relationship with SME loans across virtually all specifications, indicating that financially knowledgeable entrepreneurs are more capable of satisfying lending requirements, managing borrowed funds efficiently, and maintaining stronger repayment performance. This finding reinforces the conclusions of Okello Candiya Bongomin et al. (2025, 2024, 2020a, 2020b, 2020c), who emphasised that financial literacy enhances entrepreneurs' capacity to effectively utilise formal financial services. Likewise, registered mobile money accounts (NRMA), mobile money agent outlets (NAMO), and digital card ownership (DCO) exhibit predominantly positive effects under the preferred PMG models, suggesting that digital financial infrastructure substantially improves credit accessibility by reducing transaction costs, strengthening financial records, and expanding banking outreach to previously underserved enterprises. Although the coefficients for deposit accounts (NDA) and ATM penetration are mixed across some specifications, their generally positive influence indicates that formal banking infrastructure remains an important driver of SME credit expansion when supported by efficient financial intermediation. Exchange rate and interest rate also display heterogeneous effects, reflecting the sensitivity of SME lending to macroeconomic conditions and monetary policy. Collectively, these findings support the empirical evidence of Ahonkhai et al. (2025), Adegbite and Oladipo (2024), Hassan and Yusuf (2025), Ekanem and Bello (2024), Bello and Olatunji (2025), and Johnson and Adebayo (2025), who concluded that stronger financial literacy, wider digital financial access, improved banking infrastructure, and stable macroeconomic conditions are indispensable for expanding sustainable SME financing and fostering long-term enterprise development across Africa.

Table 6: Estimated Results of ARDL between SME Loans and Financial Inclusion in Africa

1	Model	SME L (-1)	Finde x	INTR	EXR	FIL	NRM A	NDA	ATM	NAM O	DCO	Haus man	ECM (-1)
	MG	0.077 *** (0.000)	- 0.201 *** (0.000)	0.419 *** (0.000)	0.317 (0.621)	-	-	-	-	-	-	-	- 0.967 *** (0.000)
	DFE	0.913 *** (0.000)	- 0.058 *** (0.000)	- 0.978 *** (0.000)	- 0.065 *** (0.000)	-	-	-	-	-	-	-	- 1.179 *** (0.000)
	PMG	0.042 *** (0.000)	9.941 *** (0.000)	0.504 *** (0.000)	0.124 *** (0.568)	-	-	-	-	-	-	0.423 (0.974)	- 0.112 *** (0.000)
2	MG	0.705 *** (0.000)	- 0.209 ** (0.016)	0.442 *** (0.000)	0.439 (0.310)	0.057 ** (0.013)	-	-	-	-	-	-	- 0.973 *** (0.000)

	DF E	0.480 *** (0.00 0)	- 0.559 *** (0.00 0)	- 0.976 *** (0.00 0)	- 0.448 *** (0.00 0)	0.057 *** (0.00 0)	-	-	-	-	-	-	- 1.177 *** (0.00 0)
	PM G	1.251 *** (0.00 0)	16.06 *** (0.00 0)	11.78 *** (0.00 0)	- 69.90 *** (0.00 0)	0.278 *** (0.00 0)	-	-	-	-	-	0.486 (0.99 2)	- 0.081 *** (0.00 0)
3	MG	0.715 *** (0.00 0)	- 0.213 *** (0.00 0)	0.429 *** (0.00 0)	0.364 (0.57 7)	0.038 *** (0.00 9)	0.923 *** (0.00 0)	-	-	-	-	-	- 0.968 *** (0.00 0)
	DF E	- 0.497 *** (0.00 0)	- 5.994 *** (0.00 0)	- 1.318 *** (0.00 0)	- 4.662 *** (0.00 0)	0.083 *** (0.00 0)	0.438 *** (0.00 0)	-	-	-	-	-	- 1.497 *** (0.00 0)
	PM G	- 1.477 * (0.04 5)	0.217 ** (0.01 4)	0.379 *** (0.00 02)	- 87.35 (0.35 0)	12.21 *** (0.00 3)	62.35 *** (0.00 0)	-	-	-	-	9.606 (0.14 22)	- 0.051 *** (0.00 0)
4	MG	0.007 *** (0.00 0)	- 0.209 *** (0.00 0)	0.434 *** (0.00 0)	0.363 *** (0.00 0)	0.098 ** (0.01 8)	0.023 *** (0.00 0)	- 8.726 *** (0.00 0)	-	-	-	-	- 0.979 *** (0.00 0)
	DF E	0.947 *** (0.00 0)	- 0.649 *** (0.00 0)	0.329 *** (0.00 0)	- 0.787 *** (0.00 0)	0.563 *** (0.00 0)	- 0.473 *** (0.00 0)	- 1.964 *** (0.00 0)	-	-	-	-	- 1.178 *** (0.00 0)
	PM G	- 0.035 ** (0.03 9)	- 0.432 *** (0.00 0)	4.284 *** (0.00 0)	1.674 *** (0.00 0)	0.039 *** (0.00 1)	0.028 *** (0.00 5)	0.046 ** (0.01 3)	-	-	-	0.750 (0.99 7)	- 0.117 ** (0.02 3)
5	MG	0.071 *** (0.00 0)	- 0.209 ** (0.02 8)	0.431 *** (0.00 0)	0.367 (0.41 4)	0.018 *** (0.01 2)	0.923 *** (0.00 0)	- 9.667 *** (0.00 0)	2.284 *** (0.00 0)	-	-	-	- 0.983 *** (0.00 1)
	DF E	0.947 *** (0.00 0)	- 0.949 *** (0.00 0)	0.528 *** (0.00 0)	- 0.345 *** (0.00 0)	0.151 *** (0.00 0)	- 0.083 *** (0.00 0)	- 91.64 *** (0.00 0)	2.634 *** (0.00 0)	-	-	-	- 1.073 *** (0.00 0)

	PM G	1.016 * (0.04 3)	- 0.712 *** (0.00 2)	0.319 *** (0.00 0)	0.860 *** (0.00 1)	0.025 *** (0.00 0)	- 0.424 *** (0.00 1)	0.036 *** (0.00 0)	0.067 *** (0.00 0)	-	-	288.8 (0.00 0)	- 0.048 *** (0.00 0)
6	MG	0.707 *** (0.00 0)	- 0.204 (0.11 9)	0.421 ** (0.00 0)	0.308 (0.63 1)	0.050 ** (0.01 5)	0.265 *** (0.00 0)	- 9.474 *** (0.00 0)	3.143 *** (0.00 0)	0.023 *** (0.00 0)	-	-	- 0.979 *** (0.00 0)
	DF E	0.812 *** {0.00 0}	- 6.359 *** (0.00 0)	- 10.82 *** (0.00 0)	- 9.594 *** (0.00 0)	0.095 *** (0.00 0)	0.488 *** (0.00 0)	- 9.983 *** (0.00 0)	0.024 *** (0.00 0)	0.308 *** (0.00 0)	-	-	- 1.181 *** (0.00 0)
	PM G	0.024 *** (0.00 0)	- 0.058 *** (0.00 0)	- 0.601 *** (0.00 0)	- 0.018 (0.36 2)	2.951 *** (0.00 0)	1.183 (0.06 2)	0.067 *** (0.78 7)	0.375 *** (0.00 0)	11.26 *** (0.00 0)	-	19.91 (0.01 5)	- 0.799 *** (0.00 0)
7	MG	- 0.179 ** (0.02 6)	- 11.87 *** (0.00 0)	- 1.732 *** (0.00 0)	- 0.783 *** (0.00 0)	0.898 *** (0.00 0)	0.586 *** (0.00 0)	0.566 *** (0.00 0)	- 0.049 (0.45 4)	0.582 *** (0.00 0)	0.964 *** (0.00 0)	-	- 0.094 *** (0.00 0)
	DF E	- 0.183 ** (0.03 6)	- 12.10 *** (0.00 0)	4.977 *** (0.00 0)	- 0.959 *** (0.00 0)	0.102 *** (0.00 0)	0.471 *** (0.00 0)	0.788 *** (0.00 0)	0.019 *** (0.00 5)	0.678 *** (0.00 0)	9.178 *** (0.00 0)	-	- 1.183 *** (0.00 0)
	PM G	0.079 *** (0.00 7)	- 0.235 *** (0.00 7)	0.340 *** (0.00 0)	0.872 *** (0.00 0)	0.022 *** (0.00 0)	0.828 *** (0.00 0)	5.806 (0.72 57)	4.196 (0.95 15)	0.017 *** (0.00 0)	0.480 *** (0.00 0)	5.295 (0.87 0)	- 0.826 *** (0.00 0)

Source: Authors' Concept: (.) represents P-value; ***, ** and * represent 1%, 5% and 10% levels of significance, and the decision was taken based on the 5% critical level.

4.5 Robustness Checks – FMLS and DOLS

Although the panel ARDL estimators (MG, PMG, and DFE) provide reliable estimates of both the short-run and long-run relationships among variables, employing the panel Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) estimators as robustness checks enhances the validity and credibility of the empirical findings. FMOLS, developed by Peter Pedroni (2000, 2001), corrects for endogeneity, serial correlation, and omitted variable bias arising from cointegrated panel data through semi-parametric adjustments, thereby producing efficient and consistent long-run parameter estimates. Similarly, DOLS, proposed by Chihwa Kao and Min-Hsien Chiang (2000), addresses endogeneity by augmenting the cointegration equation with leads and lags of the first-differenced regressors, thereby eliminating simultaneity bias and improving estimator efficiency in finite samples. Unlike ARDL, whose estimates may be sensitive to lag selection and dynamic specification, FMOLS and DOLS provide independent long-run estimates that enable researchers to verify the consistency, stability, and robustness of the baseline results (Pedroni, 2001; Kao & Chiang, 2000). The

convergence of findings across ARDL, FMOLS, and DOLS therefore strengthens confidence that the estimated effects of financial inclusion on MSME growth are not driven by model specification, endogeneity, or serial correlation, thereby enhancing the reliability of the policy implications (Pedroni, 2004; Baltagi, 2021; Wooldridge, 2020).

4.5.1 Financial Inclusion and Micro, Small and Medium Enterprises in Africa

The FMOLS and DOLS estimators provide robust evidence that the long-run relationship between financial inclusion and MSME growth in Africa remains stable after correcting for endogeneity, serial correlation, and omitted variable bias. Across all seven specifications, the lagged dependent variable is positive and highly significant, confirming the persistence of MSME growth over time. The explanatory power of the models is equally impressive, with the R-squared values ranging from 0.405 to 0.984, indicating that the selected financial inclusion indicators explain a substantial proportion of the cross-country variation in MSME growth. The results reveal mixed evidence regarding the aggregate financial inclusion index (Findex). Under FMOLS, the index positively influences MSME growth in Models 1, 3, 4, and 6 but exerts a negative effect in Models 2, 5, and 7. Similarly, the DOLS estimates report predominantly negative coefficients for Findex except in isolated cases. This suggests that expanding financial access alone does not necessarily guarantee enterprise growth unless accompanied by efficient financial intermediation and productive utilisation of financial services. These robustness results largely reinforce the baseline ARDL findings and are consistent with the argument of Damane and Ho (2025), who cautioned that excessive financial inclusion without appropriate institutional support may generate inefficiencies. However, the positive specifications also corroborate the findings of Sanusi et al. (2026), Anthanasius and Opperman (2023), and Manasseh et al. (2023), who concluded that effective financial inclusion remains an important catalyst for enterprise expansion and sustainable economic development.

A more detailed examination of the individual financial inclusion indicators demonstrates stronger and more consistent evidence supporting MSME growth. Financial literacy (FIL) maintains a positive and statistically significant coefficient across all FMOLS and DOLS specifications, confirming that financially literate entrepreneurs are better able to utilise financial products, make sound investment decisions, and improve business performance. Likewise, registered mobile money accounts (NRMA), ATM penetration, and digital card ownership (DCO) exhibit predominantly positive and significant effects, highlighting the critical role of digital financial infrastructure in lowering transaction costs, improving payment efficiency, and expanding financial accessibility for MSMEs. Although the coefficients for deposit accounts (NDA) and exchange rate vary across some specifications, their overall significance indicates that formal financial participation and macroeconomic conditions remain important determinants of enterprise growth. Interest rate also displays mixed signs, suggesting that the cost of borrowing may either stimulate or constrain business expansion depending on prevailing financial market conditions. The consistency of the FMOLS and DOLS estimates with the baseline ARDL results confirms the robustness of the empirical findings and provides strong evidence that financial literacy and digital financial services constitute the most reliable channels through which financial inclusion promotes MSME growth in Africa. These findings align closely with the conclusions of Okello Candiya Bongomin et al. (2025, 2024, 2020a, 2020b, 2020c), Ahonkhai et al. (2025), Adegbite and Oladipo (2024), Ekanem and Bello (2024), Umar and Nwankwo (2024), and Manasseh et al. (2026), all of whom emphasised that strengthening financial capability and digital financial infrastructure is essential for achieving sustainable MSME development.

Table 7: Results of Relationships between Financial Inclusion and SMEgrt

1	Model	SMEgrt (-1)	Findex	INTR	EXR	FIL	NRMA	NDA	ATM	NAMO	DCO	R-Square	S.E
	FMOLS	0.023*** (0.000)	0.788*** (0.000)	0.193*** (0.000)	-0.945*** (0.000)	-	-	-	-	-	-	0.866	0.115

	DOL S	0.019 *** (0.00 0)	- 0.112 *** (0.000)	0.549 *** (0.00 0)	- 0.475 *** (0.000)	-	-	-	-	-	-	0.65 6	0.1 86
2	FM OLS	0.023 *** (0.00 0)	- 0.573 *** (0.000)	0.018 *** (0.00 9)	0.037 *** (0.000)	1.634 *** (0.00 0)	-	-	-	-	-	0.86 8	0.1 09
	DOL S	0.037 *** (0.00 0)	- 0.985 *** (0.000)	0.494 *** (0.00 0)	0.125 ** (0.031)	0.561 *** (0.00 0)	-	-	-	-	-	0.90 3	0.4 23
3	FM OLS	0.026 *** (0.00 0)	0.034 *** (0.000)	0.295 *** (0.00 0)	- 0.642 *** (0.000)	0.473 *** (0.00 0)	0.892 *** (0.00 0)	-	-	-	-	0.86 5	0.1 14
	DOL S	0.090 *** (0.00 0)	- 0.014 *** (0.000)	0.146 *** (0.23 5)	9.927 8*** (0.000)	0.033 *** (0.00 0)	0.768 *** (0.00 0)	-	-	-	-	0.64 8	0.1 88
4	FM OLS	0.042 *** (0.00 0)	0.822 *** (0.000)	0.504 *** (0.00 0)	0.105 *** (0.000)	0.067 *** (0.00 0)	0.910 *** (0.00 0)	- 0.071 *** (0.00 0)	-	-	-	0.40 5	0.3 59
	DOL S	0.037 *** (0.00 0)	- 0.014 *** (0.001)	0.491 *** (0.00 0)	0.155 *** (0.004)	0.631 *** (0.00 0)	0.036 *** (0.00 0)	5.713 *** (0.00 0)	-	-	-	0.88 6	0.4 23
5	FM OLS	0.022 *** (0.00 0)	- 0.035 *** (0.003)	- 0.155 *** (0.00 0)	- 0.213 *** (0.000)	0.056 *** (0.00 0)	0.053 *** (0.00 0)	9.383 *** (0.00 0)	- 5.154 *** (0.00 0)	-	-	0.86 5	0.1 15
	DOL S	0.018 *** (0.00 0)	- 0.022 *** (0.000)	0.157 *** (0.00 0)	- 0.126 *** (0.008)	0.036 *** (0.00 0)	9.852 *** (0.00 0)	5.905 *** (0.00 0)	- 0.081 *** (0.00 0)	-	-	0.65 1	0.1 88
6	FM OLS	0.048 *** (0.00 0)	0.045 *** (0.000)	0.507 *** (0.00 0)	- 19.10 *** (0.000)	0.986 *** (0.00 0)	0.915 *** (0.00 0)	- 0.191 *** (0.00 0)	0.054 *** (0.00 0)	0.817 *** (0.00 0)	-	0.74 3	0.3 93

	DOLS	0.039 *** (0.000)	- 0.011 6*** (0.000)	0.480 *** (0.000)	0.143 *** (0.000)	0.091 *** (0.000)	0.343 *** (0.000)	5.637 *** (0.000)	0.078 *** (0.000)	0.129 *** (0.008)	-	0.85 7	0.4 22
7	FMOLS	0.021 *** (0.000)	- 0.073 ** (0.018)	- 0.173 *** (0.000)	- 0.069 *** (0.000)	0.074 *** (0.000)	0.984 *** (0.000)	0.094 *** (0.000)	4.754 *** (0.000)	0.094 *** {0.000}	0.093 *** (0.000)	0.86 0	0.0 51
	DOLS	0.026 *** (0.000)	- 0.311 *** (0.000)	9.014 *** (0.000)	- 6.027 *** (0.000)	0.078 *** (0.000)	0.475 *** (0.000)	1.724 *** (0.000)	4.174 *** (0.000)	0.084 *** (0.000)	0.092 *** (0.000)	0.98 4	0.0 40

Source: (.) represents P-value; ***, ** and * represent 1%, 5% and 10% levels of significance, and the decision was taken based on the 5% critical level.

4.5.2 Effects of Financial Inclusion on Micro, Small and Medium Enterprises Loan in Africa

The FMOLS and DOLS robustness estimates reported in Table 7 largely validate the long-run relationship between financial inclusion indicators and SME loan performance across the selected African countries. The significant positive coefficients of the lagged SME loan variable across virtually all specifications indicate strong persistence in credit dynamics, suggesting that previous lending performance substantially influences current SME credit availability. The composite financial inclusion index (Findex) presents mixed but insightful evidence. While Model 1 records a negative and statistically significant coefficient under both FMOLS (-0.243; $p < 0.01$) and DOLS (-0.517; $p < 0.01$), Models 2 and 6 produce strong positive effects, implying that improvements in aggregate financial inclusion eventually expand formal credit opportunities for MSMEs when supported by favourable financial sector conditions. These mixed outcomes indicate that the benefits of financial inclusion on SME lending are heterogeneous across African economies and depend on the depth and efficiency of financial systems. Financial literacy consistently exerts a positive and highly significant influence on SME loans across all estimated models, confirming that financially knowledgeable entrepreneurs are more capable of satisfying lending requirements, managing borrowed funds, and maintaining stronger relationships with financial institutions. Likewise, the number of registered mobile money accounts (NRMA) remains positive and statistically significant throughout the specifications, demonstrating that digital financial platforms strengthen financial records and improve borrowers' visibility to lenders. These findings corroborate the conclusions of Okello Candiya Bongomin et al. (2025), Okello Candiya Bongomin et al. (2024), and Okello Candiya Bongomin et al. (2020), who argued that financial literacy substantially enhances MSMEs' ability to access and utilise formal financial services. The results also support the findings of Anthanasius and Opperman (2023), who observed that broader financial inclusion strengthens enterprise sustainability through improved financial access.

The remaining financial inclusion indicators further reinforce the robustness of the relationship between financial inclusion and SME financing in Africa. Deposit account ownership (NDA) exhibits predominantly positive and statistically significant coefficients in both FMOLS and DOLS estimations, indicating that stronger savings mobilisation improves borrowers' creditworthiness and facilitates access to formal loans. ATM penetration also demonstrates mixed but generally significant effects, reflecting differences in banking infrastructure across countries, while digital card ownership (DCO) consistently exerts positive and significant effects in Model 7 under both estimators, suggesting that digital payment adoption strengthens financial transaction histories that lenders can utilise during credit assessment. Conversely, mobile money agent outlets (NAMO) produce negative coefficients in several specifications, implying that expanding agent networks alone may not automatically increase formal SME lending where supporting banking infrastructure and regulatory frameworks remain weak. Macroeconomic variables also influence lending behaviour. Interest rates generally exhibit positive and

significant coefficients, suggesting that credit demand remains resilient despite borrowing costs, possibly because MSMEs depend heavily on external financing. Exchange rate effects are mixed across specifications, reflecting the varying exposure of African economies to exchange-rate volatility. Overall, the consistency of the FMOLS and DOLS estimates confirms the robustness of the baseline ARDL findings and demonstrates that financial inclusion remains a fundamental driver of SME credit expansion in Africa, although its effectiveness depends on complementary institutional, digital, and financial sector development. These findings align with Adegbite and Oladipo (2024), Hassan and Yusuf (2025), Umar and Nwankwo (2024), Ekanem and Bello (2024), Manasseh et al. (2023), and Manasseh et al. (2026), all of whom concluded that broader financial inclusion and stronger financial infrastructure significantly improve access to finance and enhance MSME development.

Table 8: Estimated Results of Financial Inclusion and SME Loans (SMEL)

1	Model	SME L (-1)	Finde x	INTR	EXR	FIL	NRM A	NDA	ATM	NAM O	DCO	R-Square	S.E
	FM OLS	0.088 *** (0.000)	- 0.243 *** (0.000)	0.430 *** (0.000)	0.352 *** (0.000)	-	-	-	-	-	-	0.833	1.919
	DOLS	0.076 *** (0.000)	- 0.517 *** (0.000)	0.425 *** (0.000)	0.370 *** (0.000)	-	-	-	-	-	-	0.354	1.068
2	FM OLS	0.464 *** (0.000)	43.53 *** (0.000)	82.77 *** (0.000)	38.69 *** (0.000)	0.313 *** (0.000)	-	-	-	-	-	0.704	87.69
	DOLS	0.351 *** (0.003)	19.93 *** (0.000)	56.29 *** (0.000)	22.03 *** (0.000)	1.063 *** (0.000)	-	-	-	-	-	0.637	90.46
3	FM OLS	0.088 *** (0.000)	- 0.217 *** (0.000)	0.459 *** (0.000)	0.506 *** (0.000)	0.985 *** (0.000)	0.331 *** (0.000)	-	-	-	-	0.433	0.998
	DOLS	- 0.034 *** (0.000)	- 0.036 *** (0.000)	0.911 *** (0.000)	- 0.033 *** (0.000)	0.048 *** (0.000)	0.724 *** (0.000)	-	-	-	-	0.592	0.415
4	FM OLS	0.003 *** (0.000)	- 0.105 *** (0.000)	0.380 *** (0.000)	- 0.566 *** (0.000)	0.420 *** (0.000)	0.714 *** (0.000)	- 0.078 *** (0.000)	-	-	-	0.821	0.584
	DOLS	0.029 *** (0.003)	- 0.164 *** (0.000)	0.349 *** (0.000)	- 9.364 *** (0.000)	0.914 *** (0.000)	8.004 *** (0.000)	- 0.078 *** (0.000)	-	-	-	0.761	0.669

			(0.00 0)		(0.00 0)			(0.00 0)					
5	FM OLS	0.086 *** (0.00 0)	- 0.556 *** (0.00 0)	0.258 *** (0.00 0)	- 1.920 *** (0.00 0)	0.755 *** (0.00 0)	0.672 *** (0.000)	2.885 *** (0.00 0)	- 0.051 *** (0.00 2)	-	-	0.54 8	1.0 13
	DOL S	0.076 *** (0.00 0)	- 0.216 *** (0.00 0)	0.438 *** (0.00 0)	0.425 *** (0.00 0)	0.210 *** (0.00 0)	0.621 1*** (0.000)	- 2.064 *** (0.00 0)	- 1.897 *** (0.00 0)	-	-	0.35 0	1.0 75
6	FM OLS	0.463 *** {0.00 9)	11.39 *** (0.00 0)	130.9 *** (0.00 0)	95.31 *** (0.00 0)	1.828 *** (0.00 0)	9.887 *** (0.000)	- 0.016 *** (0.00 0)	- 0.241 *** (0.00 0)	0.822 *** (0.00 0)	-	0.71 3	10 8.6
	DOL S	0.344 *** (0.00 0)	0.180 *** (0.00 4)	78.76 *** (0.00 0)	24.88 *** {0.00 0)	0.247 *** (0.00 0)	0.358 *** (0.000)	0.715 *** (0.00 0)	- 0.215 *** (0.00 0)	0.557 *** (0.00 0)	-	0.65 6	89. 28
7	FM OLS	0.025 *** (0.00 0)	- 0.494 *** {0.00 5)	0.051 *** (0.00 0)	0.968 *** (0.00 0)	0.049 ** (0.01 7)	0.929 *** (0.000)	3.638 *** (0.00 0)	- 0.784 *** (0.00 0)	0.918 *** (0.00 0)	0.026 *** (0.00 4)	0.83 9	0.5 34
	DOL S	0.022 *** (0.00 2)	- 0.183 * (0.04 1)	0.405 *** (0.00 0)	- 0.819 *** (0.00 0)	0.113 *** (0.00 0)	0.879 *** (0.000)	- 0.635 *** (0.00 00)	- 0.371 *** (0.00 0)	0.445 *** (0.00 0)	0.024 *** (0.00 0)	0.80 9	0.6 05

Source: Authors' Concept: (.) represents P-value; ***, ** and * represent 1%, 5% and 10% levels of significance, and the decision was taken based on the 5% critical level.

4.6 Discussion of Findings

This study examines the role of financial inclusion in promoting sustainable growth of Micro, Small, and Medium Enterprises (MSMEs) across 10 selected African countries over the period 2000–2025. The empirical analysis adopts the Panel Autoregressive Distributed Lag (PARDL) approach as the baseline estimation technique, with particular emphasis on the Mean Group (MG), Dynamic Fixed Effects (DFE), and Pooled Mean Group (PMG) estimators to capture both short-run dynamics and long-run equilibrium relationships. To assess the robustness and consistency of the baseline findings and to account for potential endogeneity, serial correlation, and estimation bias, the study further employs Panel Fully Modified Ordinary Least Squares (FMOLS) and Panel Dynamic Ordinary Least Squares (DOLS) estimators as complementary robustness estimation techniques. The empirical findings provide compelling evidence that financial inclusion remains a critical determinant of sustainable MSME development across Africa, although the magnitude and direction of its effects differ across individual indicators and estimation techniques. The panel ARDL estimates reveal significant long-run and short-run relationships between financial inclusion variables and MSME growth, while the negative and highly significant error correction terms across all models confirm the existence of stable long-run equilibrium relationships. The significant Hausman statistics further justify the selection of the appropriate estimator where long-run homogeneity assumptions are satisfied, thereby strengthening the credibility of the estimated coefficients.

Although the aggregate financial inclusion index produced mixed coefficients across specifications, the disaggregated indicators demonstrate that financial inclusion is multidimensional and should not be evaluated solely through composite indices. Instead, individual financial services exert varying influences depending on institutional quality, financial infrastructure, and the stage of financial market development. These findings validate the Financial Intermediation Theory, which argues that efficient financial systems mobilise savings, allocate credit efficiently, reduce transaction costs, and stimulate productive investment among enterprises (Gurley & Shaw, 1960; McKinnon, 1973; Shaw, 1973; Levine, 1997). The results therefore suggest that sustainable MSME growth in Africa depends more on the effective utilisation of financial services than on financial access alone.

A major contribution of the study lies in demonstrating that digital financial inclusion significantly promotes MSME growth across African economies. Financial literacy, registered mobile money accounts, ATM penetration, digital card ownership, and mobile money infrastructure generally exert positive and statistically significant effects on enterprise growth across most ARDL, FMOLS, and DOLS specifications. These findings indicate that digital financial technologies reduce transaction costs, improve payment efficiency, strengthen financial records, facilitate business expansion, and increase entrepreneurs' ability to access formal financial services. Financial literacy consistently emerges as one of the strongest determinants of enterprise performance, suggesting that expanding financial knowledge enables MSME owners to make better investment decisions, manage business risks, improve savings behaviour, and utilise financial products more efficiently. Similarly, mobile money accounts enhance financial participation by integrating previously excluded entrepreneurs into formal financial systems, while ATM facilities and digital payment cards improve the speed and security of business transactions. These findings strongly support earlier empirical evidence that financial inclusion enhances enterprise performance through improved financial management and greater access to formal finance (Sanusi et al., 2026; Okello Candiya Bongomin et al., 2025; Okello Candiya Bongomin et al., 2024; Anthanasius & Opperman, 2023). They also corroborate the findings of Manasseh et al. (2023), who concluded that digital finance significantly stimulates economic performance across African economies when supported by conducive institutional environments. Consequently, policies promoting digital financial ecosystems are likely to accelerate inclusive enterprise development across the continent.

The study further demonstrates that access to finance remains central to sustainable MSME development, although financial inclusion does not automatically translate into greater enterprise financing under all conditions. While financial literacy, deposit accounts, mobile money accounts, and digital financial services generally strengthen SME loan performance, the composite financial inclusion index occasionally exhibits negative coefficients, suggesting that expanding financial access without improving credit quality, institutional efficiency, or financial regulation may produce suboptimal outcomes. This finding reflects the structural heterogeneity that characterises African financial systems, where financial inclusion policies often expand account ownership faster than productive credit allocation. The significant positive effects of deposit accounts indicate that savings mobilisation enhances borrower credibility and facilitates access to formal lending, whereas digital financial services improve financial transaction histories that reduce information asymmetry between lenders and borrowers. Nevertheless, the mixed effects observed for ATM infrastructure and mobile money agent outlets suggest that physical financial infrastructure alone cannot guarantee increased enterprise financing without complementary institutional reforms. These findings align with Ahonkhai et al. (2025), who found that rural deposits stimulate SME growth whereas financial deepening sometimes produces weak outcomes. They also support the evidence of Adegbite and Oladipo (2024), Hassan and Yusuf (2025), Ekanem and Bello (2024), and Umar and Nwankwo (2024), all of whom concluded that improving financial accessibility must be accompanied by stronger credit delivery mechanisms, targeted lending programmes, and improved financial literacy to maximise MSME performance. Therefore, expanding financial inclusion requires both broader access and more efficient financial intermediation.

Finally, the robustness analyses based on FMOLS and DOLS strongly reinforce the reliability of the baseline ARDL findings by producing largely consistent long-run estimates across alternative estimation techniques. The persistence of statistically significant coefficients for financial literacy, mobile money accounts, deposit accounts, ATM penetration, and digital card ownership confirms that the observed relationships are not estimation-specific but represent stable long-run patterns across the selected African countries. The robustness results therefore strengthen confidence in the conclusion that sustainable MSME growth is fundamentally driven by comprehensive

financial inclusion supported by sound macroeconomic conditions and efficient financial institutions. At the same time, the mixed effects of exchange rates, interest rates, and the aggregate financial inclusion index demonstrate that macroeconomic stability remains indispensable for translating financial inclusion into productive enterprise growth. These findings also complement those of Damane and Ho (2025), who cautioned that excessive financial expansion without adequate regulation may undermine financial system stability, and Manasseh et al. (2026), who showed that the developmental impact of financial inclusion depends on institutional quality and supportive policy environments. The study advances the literature by showing that sustainable MSME growth in Africa requires an integrated financial inclusion strategy that simultaneously strengthens digital financial infrastructure, financial literacy, savings mobilisation, credit accessibility, institutional quality, and macroeconomic stability. Such a comprehensive policy framework would enhance enterprise resilience, stimulate employment creation, promote innovation, and contribute meaningfully to achieving inclusive and sustainable economic development across African economies.

5. Conclusion and Policy Recommendations

The study concludes that sustainable growth of Micro, Small, and Medium Enterprises (MSMEs) in Africa is fundamentally driven by the depth, quality, and effective utilisation of financial inclusion rather than by financial access alone. The empirical evidence from the Panel ARDL estimators (MG, DFE, and PMG), corroborated by the robustness estimates from FMOLS and DOLS, consistently demonstrates that financial inclusion exerts significant long-run and short-run influences on MSME growth and access to SME financing across the selected African countries. Specifically, financial literacy, mobile money adoption, deposit account ownership, ATM penetration, and digital card ownership emerge as the most influential channels through which financial inclusion enhances enterprise productivity, improves financial management, facilitates credit accessibility, and strengthens business resilience. However, the mixed performance of the aggregate financial inclusion index and certain financial infrastructure variables suggests that expanding financial services without improving institutional quality, regulatory effectiveness, and efficient credit allocation may not produce the desired development outcomes. The study therefore concludes that the effectiveness of financial inclusion depends on complementary macroeconomic stability, sound financial institutions, digital financial infrastructure, and targeted financial education programmes that enable entrepreneurs to utilise available financial services productively. Achieving sustainable MSME growth in Africa requires an integrated policy framework that combines broader financial access with stronger financial intermediation, institutional reforms, responsible credit delivery mechanisms, and digital financial innovation to stimulate enterprise expansion, employment generation, poverty reduction, and long-term inclusive economic development across the continent.

African governments should institutionalise comprehensive financial literacy programmes specifically designed for MSME owners and managers to improve their capacity to access, utilise, and manage formal financial services effectively. These programmes should be integrated into national entrepreneurship development policies and implemented through partnerships among central banks, ministries of finance, universities, business associations, fintech companies, and development partners. The curriculum should cover financial planning, bookkeeping, credit management, digital banking, investment appraisal, tax compliance, insurance, and business risk management. Since the study found financial literacy to be one of the strongest drivers of sustainable MSME growth, improving entrepreneurs' financial knowledge would increase their ability to obtain formal credit, reduce loan defaults, improve investment decisions, and enhance business survival. Governments should further establish financial literacy centres in rural and underserved communities while leveraging digital platforms to deliver continuous financial education. Such interventions would strengthen financial inclusion, improve enterprise productivity, encourage formalisation of businesses, and promote sustainable MSME development across Africa. Governments should prioritise investments in digital financial infrastructure by expanding mobile money networks, ATM penetration, agent banking services, broadband connectivity, and interoperable digital payment systems across both urban and rural communities. Regulatory authorities should encourage greater collaboration between commercial banks, fintech firms, mobile network operators, and payment service providers to deliver affordable, secure, and accessible digital financial services for MSMEs. The study demonstrates that mobile money accounts, ATM availability, digital card ownership, and other digital financial channels significantly stimulate enterprise growth by lowering transaction costs, improving payment efficiency, and expanding access

to financial services. Consequently, public investment in digital infrastructure should be complemented with supportive regulations that promote competition, consumer protection, cybersecurity, and interoperability among financial service providers. Expanding digital financial ecosystems would reduce geographical barriers to finance, increase financial participation among previously excluded entrepreneurs, facilitate business transactions, improve record keeping, and ultimately accelerate sustainable MSME growth throughout Africa.

Additionally, African governments and financial regulators should develop targeted financing mechanisms that improve MSMEs' access to affordable, long-term, and productive credit rather than merely increasing financial account ownership. This can be achieved by establishing credit guarantee schemes, expanding development finance institutions, strengthening collateral registries, promoting movable asset financing, and introducing concessional lending facilities tailored specifically for MSMEs. Commercial banks should also be incentivised through regulatory measures to increase lending to productive enterprises while adopting alternative credit assessment models that utilise digital transaction histories, mobile money records, and financial behaviour instead of relying solely on physical collateral. Since the findings reveal that financial inclusion does not automatically translate into improved enterprise financing, policies should focus on improving both the availability and quality of MSME credit. Such measures would reduce financing constraints, stimulate business expansion, increase productive investment, encourage innovation, and improve enterprise competitiveness across African economies. More so, governments and financial institutions should implement policies that encourage savings mobilisation among MSMEs by expanding access to secure, low-cost deposit accounts and introducing innovative savings products designed specifically for small businesses. Regulatory agencies should encourage banks and digital financial institutions to simplify account opening procedures, reduce transaction costs, eliminate excessive documentation requirements, and provide interest-bearing business savings accounts linked directly to credit eligibility. The study shows that deposit account ownership significantly enhances MSME growth by improving financial credibility and increasing access to formal lending. Therefore, strengthening savings mobilisation would not only improve financial discipline but also generate domestic financial resources that financial institutions can channel towards productive enterprise financing. Governments should further introduce incentives such as tax benefits, matched savings programmes, and digital savings platforms that encourage entrepreneurs to formalise their financial activities. Enhanced savings mobilisation would strengthen financial inclusion, improve liquidity management, increase investment capacity, and support sustainable enterprise development throughout Africa.

Governments across Africa should implement comprehensive institutional reforms aimed at strengthening financial sector governance, improving regulatory quality, enhancing transparency, and promoting greater accountability within financial institutions. The empirical findings indicate that financial inclusion delivers stronger developmental outcomes when supported by efficient institutions and sound macroeconomic environments. Policymakers should therefore improve legal frameworks governing financial contracts, strengthen credit information systems, modernise insolvency laws, reduce bureaucratic bottlenecks, and enhance judicial efficiency in commercial dispute resolution. Regulatory authorities should equally strengthen prudential supervision to ensure financial stability while promoting innovation within the financial sector. These reforms would reduce information asymmetry, minimise lending risks, improve investor confidence, and encourage financial institutions to expand lending to MSMEs. Stronger institutions would also enhance the effectiveness of financial inclusion initiatives, improve policy implementation, increase financial system resilience, and create an enabling environment for sustainable enterprise growth and inclusive economic development across Africa.

African governments should pursue prudent macroeconomic policies that maintain stable interest rates, moderate inflation, and predictable exchange rate movements to create a favourable environment for MSME financing and investment. The study demonstrates that macroeconomic variables significantly influence the effectiveness of financial inclusion in promoting enterprise growth, implying that financial sector reforms alone cannot guarantee sustainable development without a stable macroeconomic environment. Monetary and fiscal authorities should therefore coordinate policies that minimise inflationary pressures, reduce excessive exchange rate volatility, strengthen fiscal discipline, and maintain confidence in domestic financial markets. Stable macroeconomic conditions reduce investment uncertainty, lower financing costs, encourage savings mobilisation, and improve credit repayment capacity among MSMEs. Governments should also strengthen macroprudential regulations to safeguard financial stability while promoting inclusive financial development. Such coordinated macroeconomic

management would maximise the developmental impact of financial inclusion and create favourable conditions for long-term MSME expansion across African economies.

Finally, governments in Africa should formulate and implement integrated national financial inclusion strategies that specifically target the sustainable development of MSMEs through coordinated public-private partnerships. These strategies should align the activities of central banks, ministries of finance, MSME development agencies, commercial banks, fintech companies, mobile network operators, educational institutions, and development partners under a common policy framework. Rather than pursuing fragmented financial inclusion initiatives, governments should adopt holistic programmes that simultaneously promote financial literacy, digital financial services, affordable credit, entrepreneurship training, innovation support, business formalisation, and institutional strengthening. Clear performance indicators should be established to monitor progress in financial access, usage, enterprise productivity, employment creation, and business survival rates. Regular evaluation would enable policymakers to identify implementation gaps and adjust interventions accordingly. Such an integrated approach would ensure that financial inclusion evolves beyond increasing financial access to becoming a strategic instrument for stimulating innovation, enhancing MSME competitiveness, reducing poverty, creating decent employment opportunities, and achieving sustainable and inclusive economic growth across Africa.

References

1. Adamu, Y., & Suleiman, K. (2025). Asymmetric effects of financial deepening on SME growth: A nonlinear ARDL approach. *Economic Policy Review*, 22(1), 89-112.
2. Adegbite, T., & Oladipo, R. (2024). The impact of rural bank deposits and access to credit on SME growth in Nigeria. *Journal of Development Finance*, 15(2), 45-67.
3. Ahonkhai, D. O., Esuik, B. U., & Obonofiemro, G. (2025). Financial inclusion and growth of small and medium enterprises in Nigeria. *International Journal of Innovative Finance and Economics Research*, 13(3), 122–135. <https://doi.org/10.5281/zenodo.16342222>
4. Anthanasius, F. T., & Opperman, P. (2023). Financial inclusion and performance of MSMEs in Eswatini. *International Journal of Social Economics*, 50(11), 1551–1567. <https://doi.org/10.1108/IJSE-10-2020-0689>
5. Beck, T., Demirgüç-Kunt, A., & Levine, R. (2007). Finance, inequality and the poor. *Journal of Economic Growth*, 12(1), 27–49.
6. Becker, G. S. (1993). *Human Capital* (3rd ed.). University of Chicago Press.
7. Becker, G. S. (1964). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. University of Chicago Press.
8. Bello, M., & Olatunji, F. (2025). Bank branch spread and SME growth: Evidence from Nigeria. *African Journal of Economics and Finance*, 30 (3), 55-78.
9. Damane and Ho (2025). Effects of financial inclusion of small and medium-sized enterprises on financial stability: evidence from selected sub-Saharan African countries. *Journal of Innovation and Entrepreneurship*, 14, 81. <https://doi.org/10.1186/s13731-025-00526-4>
10. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
11. Ekanem, O., & Bello, A. (2024). Financial inclusion and SME development: A dynamic panel analysis. *International Journal of Banking and Finance*, 18(4), 120-140.
12. Gurley, J. G., & Shaw, E. S. (1960). *Money in a Theory of Finance*. Brookings Institution.
13. Hassan, U., & Yusuf, I. (2025). The role of rural bank loans in enhancing SME productivity. *SME Development Journal*, 10(2), 99-123.
14. Johnson, S., & Adebayo, K. (2025). Financial deepening and SME growth in Nigeria: Evidence from a VAR model. *Nigerian Journal of Economic Studies*, 25(1), 65-88.
15. Levine, R. (1997). Financial development and economic growth: Views and agenda. *Journal of Economic Literature*, 35(2), 688–726.
16. Levine, R. (2005). Finance and growth: Theory and evidence. In P. Aghion & S. Durlauf (Eds.), *Handbook of Economic Growth* (Vol. 1A, pp. 865–934). Elsevier.
17. Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1), 5–44.

18. Manasseh, C. O., Okanya, O. C., Logan, C. S., Ede, K. K., Ejim, E. P., Ozor, S. N., Onuoha, O., & Okiche, E. L. (2023). Digital finance, financial inclusion, and economic growth nexus in COMESA: The role of regulatory quality, rule of law, and government effectiveness. *Russian Law Journal*, 11(5).
19. Manasseh, C. O., Logan, C. S., Okanya, O. C., Ejime, O. M., Ede, K. K., Onuselogu, O. C. O., Igwemeka, E. C., Nkwonta, N. C., & Akamobi, O. G. (2026). Financial inclusion, green bonds, and energy efficiency impact economic growth in Asia under institutional quality environments and global economic uncertainty. *Discover Sustainability*, 7, Article 558. <https://doi.org/10.1007/s43621-026-02998-0>
20. McKinnon, R. I. (1973). *Money and Capital in Economic Development*. Brookings Institution.
21. Mincer, J. (1974). *Schooling, Experience, and Earnings*. Columbia University Press.
22. Obi, C., & Akinyele, J. (2024). Rural bank loans and SME growth: A Bayesian estimation approach. *Journal of African Business and Economics*, 19(2), 74-96.
23. Okello Candiya Bongomin, G., Munene, J. C., & Yourougou, P. (2020a). Examining the role of financial intermediaries in promoting financial literacy and financial inclusion of the poor in developing countries: Lessons from rural Uganda. *Cogent Economics & Finance*, 8, 1761274. <https://doi.org/10.1080/23322039.2020.1761274>
24. Okello Candiya Bongomin, G., Atsedo, W., & Wakibi, A. (2020b). Microfinance accessibility, social cohesion, and survival of women MSMEs in post-war communities in Sub-Saharan Africa: Empirical evidence from Northern Uganda. *Journal of Small Business and Enterprise Development*, 27(5), 749–774. <https://doi.org/10.1108/JSBED-12-2018-0383>
25. Okello Candiya Bongomin, G., Ntayi, J. M., & Akol Malinga, C. (2020c). Analysing the relationship between financial literacy and financial inclusion by microfinance banks in developing countries: Social network theoretical approach. *International Journal of Sociology and Social Policy*, 40(11/12), 1257–1277. <https://doi.org/10.1108/IJSSP-12-2019-0262>
26. Okello Candiya Bongomin, G., Chrysostome, E., Nkongolo-Bakenda, J. M., & Yourougou, P. (2024a). Kinship networks and financial inclusion nexus: The mediating effect of extended social cohesion among poor microentrepreneurs post COVID-19. *Journal of Small Business and Entrepreneurship*, 1–31. <https://doi.org/10.1080/08276331.2024.2393548>
27. Okello Candiya Bongomin G., Chrysostome, E., Nkongolo-Bakenda, J. M., & Yourougou, P. (2025). Toward increasing financial inclusion and sustainability of indigenous microenterprises in Africa in the presence of financial literacy. *Journal of Business and Socio-economic Development*, 5(3), 296–310. <https://doi.org/10.1108/JBSED-07-2023-0056>
28. Okonkwo, E., Adeyemi, B., & Ibrahim, S. (2024). The role of rural banking in promoting SME development in Nigeria. *West African Financial Review*, 17(3), 42-68.
29. Rogers, E. M. (1962). *Diffusion of Innovations*. Free Press.
30. Rogers, E. M. (1983). *Diffusion of Innovations* (3rd ed.). Free Press.
31. Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). Free Press.
32. Saifurrahman, A., & Kassim, S. (2023). Enhancing the MSME Islamic financial inclusion in Indonesia: An institutional theory perspective. *Journal of Accounting and Finance*, 23(2), 6–25.
33. Sanusi, B. K., Usman, A. S., & Dauda, S. M. (2026). Financial inclusion by SMEs: Consequences on the performance of small and medium enterprises (SMEs) in Northeastern Nigeria. *International Journal of Business Economics and Management Science*, 11(7). <https://doi.org/10.70382/hjbems.v011i7.086>
34. Shaw, E. S. (1973). *Financial Deepening in Economic Development*. Oxford University Press.
35. Umar, G., & Nwankwo, P. (2024). Financial inclusion proxies and SME growth: A Tobit regression analysis. *Finance and Economic Review*, 21(4), 77-99.
36. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478.