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The Moderating Effect of Business Growth On Financial Inclusion and Sustainability of Small and Medium Enterprises in North Central Nigeria

Faisal Ahmed Almakura, Nasamu Gambo, Danjuma Bwese Tanko
Department of Business Administration, Nile University of Nigeria, Abuja

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Abstract: *Small and Medium Enterprises (SMEs) are pivotal to economic development in Nigeria, yet their sustainability is often constrained by limited access to formal financial services. While financial inclusion is widely promoted as a catalyst for SME resilience, empirical evidence on its effectiveness remains inconsistent, suggesting the influence of contingent factors. This study addresses a critical gap by investigating whether business growth moderates the relationship between financial inclusion and SME operational efficiency—a key indicator of sustainability—in North Central Nigeria. Employing a quantitative, cross-sectional design, data were collected via structured questionnaires from a stratified sample of 399 SMEs across Benue, Kogi, Kwara, Nasarawa, Niger, Plateau, and the Federal Capital Territory. The constructs of financial inclusion were operationalized through six dimensions: Affordable Banking Services, Banking Diversity, Consumer Protection, Financial Literacy, Inclusive Credit Scoring, and Insurance Uptake. Data were analysed using Structural Equation Modelling (SEM) with ADANCO software to test direct and moderating effects. The results reveal that Banking Diversity ($\beta = 0.518$, $p < 0.01$) and Business Growth ($\beta = 0.435$, $p < 0.01$) have significant positive direct effects on Operational Efficiency. Conversely, Financial Literacy, Inclusive Credit Scoring, and Insurance Uptake showed non-significant or negative direct relationships. Crucially, the moderation analysis indicates that Business Growth significantly enhances the positive effects of Consumer Protection ($\beta = 0.090$, $p < 0.05$) and Insurance Uptake ($\beta = 0.124$, $p < 0.05$) on Operational Efficiency. However, it does not strengthen, and in some cases diminishes, the influence of other financial inclusion dimensions. The model explains 78% of the variance in Operational Efficiency ($R^2 = 0.780$). The study concludes that the impact of financial inclusion on SME sustainability is not uniform but is critically shaped by a firm's growth trajectory. Policies that treat SMEs as a homogenous group are likely to be ineffective. The findings advocate for a differentiated, growth-sensitive approach to financial inclusion, prioritizing diverse banking services, robust consumer protection, and tailored insurance products to support scalable SMEs in achieving long-term sustainability*

Keywords: financial inclusion, business growth, SME sustainability, operational efficiency, north central Nigeria, moderating effect, structural equation modelling

INTRODUCTION

Small and Medium Enterprises (SMEs) are widely recognised as engines of economic diversification, innovation, and inclusive employment. In Nigeria, they contribute significantly to GDP and poverty alleviation, particularly in underserved regions. However, their sustainability is severely hindered by poor access to formal financial services, limited credit facilities, and weak institutional frameworks (Babajide et al., 2021). Financial inclusion—ensuring businesses have access to banking, credit, insurance, and savings—is considered a strategic lever for long-term SME sustainability (Adegbite et al., 2021). Despite this, inclusion outcomes remain inconsistent across Nigerian SMEs, particularly in North Central Nigeria. This inconsistency raises critical questions about what enables some SMEs to thrive while others fail, even under the same financial inclusion conditions.

While international studies validate the link between financial inclusion and business performance, few have investigated business growth as a moderating factor. For example, Khémiri et al. (2024) identified a curvilinear relationship between tangible investment and firm sustainability, with financial inclusion acting as a facilitator—but not growth. Similarly, Adegbite and Machethe (2020) found that smallholder entrepreneurs benefit differently from financial access based on regional infrastructure and institutional strength. Yet, none of these studies examined whether SMEs with stronger growth strategies derive more value from financial inclusion. This reveals a conceptual and empirical blind spot, particularly for African economies where systemic constraints shape firm-level outcomes. The failure to consider moderating variables like growth impairs our understanding of SME survival pathways.

Nigerian studies also fall short of addressing this interaction. Agbim (2020) explored how government policy and financial inclusion influence SME performance in South East Nigeria but ignored growth orientation. Similarly, Ochinanwata et al. (2021) assessed entrepreneurial financing models without evaluating whether SME scalability alters financial utilisation patterns. Even in studies that acknowledge business constraints—such as low digital finance adoption or regulatory inefficiencies—the effect of growth remains unexplored (Soetan, Mogaji, & Nguyen, 2021). As a result, policy recommendations remain incomplete, lacking differentiation between SMEs with latent growth potential and those that are structurally stagnant.

Despite financial inclusion being widely promoted through fintech, agency banking, and microfinance, many SMEs in North Central Nigeria remain financially marginalised. A major limitation lies in their inability to scale operations or manage financial resources effectively (Babajide et al., 2021). Many lack the internal systems and growth orientation to make strategic use of loans, insurance, or remittance channels. Moreover, policy volatility and regulatory inertia exacerbate these challenges, undermining the intended outcomes of inclusion initiatives. In regions with underdeveloped financial infrastructure, this leads to a mismatch between service availability and SME absorptive capacity. Unless business growth is accounted for, financial inclusion alone cannot improve sustainability outcomes.

Business growth is not merely an outcome but a strategic input that can enhance SMEs' ability to capitalise on financial inclusion. High-growth SMEs are more likely to seek and utilise external financing, invest in workforce training, adopt technology, and expand into new markets (Khémiri et al., 2024). Yet, most Nigerian SMEs face structural bottlenecks—such as informality, market fragmentation, and limited scalability—that hinder growth potential (Agbim, 2020). These realities suggest that only SMEs with an enabling internal environment can truly benefit from financial inclusion. Ignoring this moderating role limits the effectiveness of both policy and practice, contributing to persistent SME failures despite growing financial access.

This study addresses a fundamental question neglected in both policy and academia: Does business growth moderate the relationship between financial inclusion and SME sustainability? Without this lens, interventions will continue to treat SMEs as a homogenous group, ignoring their differential capacity to translate financial access into operational efficiency. Bridging this knowledge gap is essential for crafting effective inclusion strategies that reflect the realities of Nigerian SMEs. The study contributes to a nuanced understanding of how SMEs in North Central Nigeria can be supported not only to access finance but also to grow sustainably and competitively.

LITERATURE REVIEW

Conceptual Clarification

Financial Inclusion

Financial inclusion has been recognised as a critical enabler of economic development, poverty reduction, and SME sustainability in developing economies. It refers to the accessibility, availability, and usage of formal financial services, such as banking, credit, insurance, remittances, and digital payment systems, particularly among underserved populations (Gigauri, 2022). In the context of SMEs, financial inclusion has played a significant role in facilitating access to credit, promoting investment, and enhancing financial stability (Thathsarani, Wei, & Alariqi, 2023). Despite its acknowledged benefits, financial exclusion remains a major challenge in many emerging markets, where businesses struggle with limited access to formal financial systems due to institutional inefficiencies, weak financial infrastructure, and policy inconsistencies (Niekerk, 2024). Financial inclusion has played a pivotal role in enhancing SME sustainability by facilitating access to credit, insurance, and digital financial services. However, its effectiveness has varied across different business contexts, with SMEs facing structural barriers, technological challenges, and regulatory constraints that have influenced their ability to leverage financial inclusion for long-term growth (Selim, 2024). This study has defined financial inclusion as the ability of SMEs to access and effectively utilise financial services to achieve business sustainability. Understanding how business growth moderates the financial inclusion-sustainability relationship has remained crucial in addressing gaps in SME financial strategies, guiding policy interventions, and ensuring a more inclusive financial ecosystem for small businesses in Nigeria.

Operational Efficiency

Operational efficiency refers to an institution's capacity to optimise input utilisation while maintaining high-quality output, rapid delivery, and sustainable performance. It intersects with fields such as operations management, environmental economics, and development finance, reflecting both tactical functionality and broader strategic objectives. Increasingly, operational efficiency is viewed not only as a metric of profitability, but as a determinant of sustainability and systemic resilience (Liang et al., 2018). It aligns firms with environmental regulations, investor expectations, and socio-economic mandates. In sustainability discourses, efficiency is recast as a governance construct essential for aligning firm operations with macro-level development goals. Technological innovations, stakeholder pressures, and volatile global contexts have elevated its relevance. As a result, the conceptual framing of efficiency has shifted beyond cost-cutting to encompass adaptability and ecological responsibility (Chaturvedi et al., 2023). This evolution underscores its foundational role in modern institutional design and policy alignment. Based on these insights, this study defines operational efficiency as the firm-level capability to optimise inputs, refine processes, and sustain adaptability while upholding environmental and economic objectives. This definition integrates four key dimensions—resource use, process design, energy intensity, and system responsiveness (Liang et al., 2018); (Katchasuwanmanee et al., 2016). Within this thesis, operational efficiency is conceptualised as a dynamic attribute necessary for aligning institutional operations with sustainable development frameworks (Chaturvedi et al., 2023). It addresses challenges at the nexus of productivity, environmental stewardship, and resilience. Rather than static cost reduction, efficiency is interpreted here as a transformative capacity enabling continuity and impact under complexity. In this light, operational efficiency serves as both a metric of effectiveness and a mechanism for achieving sustainable economic objectives.

Business growth

Business growth, once measured purely by revenue or workforce size, has evolved into a multidimensional concept that reflects innovation, adaptability, and sustainability. Contemporary definitions extend beyond financial indicators to include societal contributions, learning capacity, and environmental responsiveness (Spescha & Woerter, 2019). This broader interpretation aligns growth with competitiveness in knowledge economies and transitional contexts. Particularly in green and digital economies, business growth is increasingly scrutinised for its systemic relevance. It has become integral to strategic management and policy frameworks aiming to promote sustainable development. Growth trajectories are now assessed not only for scale but also for quality, resilience, and alignment with environmental, social, and governance (ESG) goals (Carayannis et al., 2014). This conceptual shift mandates new frameworks for understanding growth in academic, policy, and corporate arenas. Drawing on these insights, this study defines business growth as the multidimensional, sustainability-aligned expansion of a firm's operations, capabilities, and socio-economic value. This definition centres on four interlocking dimensions: financial viability, market access, innovation performance, and institutional adaptability (Spescha & Woerter, 2019). The study adopts this framework to analyse growth in energy-focused enterprises across developing economies. Business growth is not merely a corporate goal but a mechanism of public interest, capable of advancing environmental sustainability, financial inclusion, and systemic resilience (Tebo, 2005). This approach reframes growth from a static financial target to a dynamic, policy-relevant construct. The resulting perspective recognises business growth as central to climate-smart development and equitable innovation ecosystems (Carayannis et al., 2014). As such, it forms a critical thematic pillar within this doctoral inquiry into sustainable economic transformation.

Theoretical Review

This study adopts two interlinked theories—**Financial Intermediation Theory** and the **Theory of Financial Inclusion**—to guide its analysis of the moderating role of business growth in the relationship between financial inclusion and SME sustainability in North Central Nigeria. These frameworks provide a theoretical lens to understand how financial structures and access mechanisms support or constrain SME operational efficiency. The selected theories are aligned with contemporary empirical findings and provide a robust foundation for examining the influence of financial systems on SME performance, especially in a region marked by infrastructural and economic challenges (Effiom & Edet, 2023).

The **Financial Intermediation Theory**, originating from Schumpeter's (1911) insights and later formalized by Diamond and Dybvig, emphasizes the critical function of financial institutions as intermediaries that lower transaction costs and mitigate financial risk. This theory is particularly useful for understanding the mechanisms through which banks and fintechs influence credit availability and liquidity for SMEs. In Nigeria, where traditional finance remains restrictive, the role of intermediaries becomes even more significant in shaping entrepreneurial outcomes (Dimnwobi et al., 2023). In Nigeria, financial intermediation is largely administered by commercial banks, microfinance institutions, and digital platforms. However, SMEs often face restrictive lending conditions including excessive collateral demands and limited credit histories. Despite efforts by the Central Bank of Nigeria to stimulate SME access through intervention funds and guarantee schemes, systemic barriers remain. These challenges justify the need for this research to explore how business growth may enhance or weaken the efficacy of financial intermediation in promoting SME sustainability in North Central Nigeria (Babajide et al., 2024).

The **Theory of Financial Inclusion**, developed by Sarma and Pais (2011), offers a multidimensional view of how financial access, usage, and quality improve household welfare and entrepreneurial capacity. The theory argues that financial inclusion is not limited to bank account ownership but encompasses credit scoring, insurance, financial literacy, and consumer protection. It is particularly relevant for this study as it allows for a nuanced understanding of how SMEs interact with financial services across formal and informal channels (Omenihu et al., 2024). In North Central Nigeria, financial exclusion persists despite national inclusion policies. Many SMEs continue to rely on informal funding sources, limiting their growth potential. Financial inclusion theory provides the scaffolding to evaluate how subcomponents—such as credit scoring, financial literacy, and insurance—impact operational efficiency. This approach directly aligns with the study's objectives, offering a granular assessment of the mechanisms that influence SME resilience in underserved regions (Agbim, 2023).

Integrating both theories allows this study to assess how financial inclusion constructs like literacy, credit scoring, and insurance interact with financial intermediation mechanisms under varying conditions of business growth. As SMEs grow, their capacity to engage with complex financial products increases, potentially enhancing their sustainability. The dual-theory approach also facilitates a comparative analysis of financially underserved versus well-supported SMEs, revealing disparities in operational efficiency outcomes (Dimnwobi et al., 2023). This framework directly supports the study's seventh objective, which investigates the moderating role of business growth in financial inclusion outcomes. A business experiencing positive growth is more likely to build financial credibility, attract investors, and adopt sophisticated financial tools. Conversely, stagnant or declining businesses may remain excluded regardless of broader inclusion efforts. The theoretical framework captures this nuance, offering a structured path to measure and interpret these effects across diverse SME profiles (Adegboye & Iweriebor, 2023).

Empirical Review

Atta and Ibrahim (2024) explored the relationship between financial inclusion and economic development in Nigeria, using data from the Central Bank of Nigeria and the World Development Indicators. Their study demonstrated both short-term and long-term relationships between financial inclusion and economic growth, supporting the finance-growth theory. However, they noted that financial literacy remains a major barrier to financial inclusion, as many SMEs lack awareness of available financial services. While the study provided strong macroeconomic insights, it did not focus on SME-specific financial inclusion, necessitating further research in SME contexts.

Oyewale and Alabi (2024) assessed how financial inclusion influences SME performance in Osun State, Nigeria. Using multiple regression analysis on primary data collected from 450 SMEs, the study found that financial inclusion positively affects SME sales growth, payment infrastructure, and access to finance. However, findings also revealed that many SMEs struggle with poor banking infrastructure, low awareness of financial products, and inconsistent government policies. The study was limited to a single state, making its findings less generalizable to other regions of Nigeria. Future studies should cover a broader geographical scope to provide more comprehensive results.

Ololade (2024) examined the impact of fintech on SME financing in Nigeria and the USA. Findings showed that mobile banking, peer-to-peer lending, and blockchain finance have significantly improved SME access to credit. However, in Nigeria, fintech adoption remains constrained by regulatory bottlenecks, cybersecurity concerns, and lack of digital literacy. The study recommended government interventions to improve fintech regulations and SME awareness of digital finance. A key limitation was its focus on urban SMEs, neglecting the rural digital divide. Future studies should explore rural fintech adoption trends.

Bamfo (2024) investigated the factors contributing to the high failure rates of SMEs in Ghana, emphasizing financial constraints as a major determinant. The study employed a qualitative research methodology, utilizing secondary data from academic journals, government reports, and policy documents. Findings revealed that limited access to finance, managerial inefficiencies, regulatory challenges, and infrastructural deficits significantly hinder SME survival. The study recommended improving financial accessibility through tailored credit schemes and financial literacy programs. However, the study lacked primary data, limiting its applicability in understanding specific financial inclusion dynamics that directly affect SME sustainability.

Ekechi et al. (2024) conducted a comprehensive review of SME growth strategies in Africa, highlighting the role of financial inclusion, policy support, and technological adoption. Findings emphasized that SMEs leveraging digital finance and fintech solutions experienced higher sustainability levels. However, the study lacked empirical validation through primary data collection, making it difficult to assess the specific challenges faced by SMEs in Ghana.

Agyapong et al. (2024) examined the impact of monitoring and evaluation (M&E) systems on SME growth and sustainability in Ghana. Findings revealed that SMEs with structured M&E systems experienced improved business resilience, financial stability, and digitalization adoption. However, the study did not assess the moderating role of business growth in financial inclusion frameworks, which is critical for SME expansion.

Odame et al. (2024) investigated the nexus between financial inclusion and economic growth in Ghana, using panel data from the World Bank and Heritage Foundation. Findings showed that financial penetration drives GDP growth, yet many SMEs remain financially excluded due to regulatory barriers and banking inefficiencies. However, the study did not explore the role of business growth in moderating financial inclusion's impact on SME sustainability, leaving a significant research gap.

Njagi and Mutwiri (2024) investigated the impact of financial inclusion on the performance of Kenya's top 100 SMEs. Using micro savings, microcredit, micro insurance, and digital banking as independent variables, the study applied a descriptive research design with data collected from financial officers in mid-sized companies. Findings revealed that tailored financial products enhance SME growth, with digital banking improving cash flow management. However, the study focused primarily on large SMEs, neglecting smaller enterprises and informal businesses, which limits generalizability. Future research should examine how financial inclusion impacts SMEs across various business sizes and sectors to capture a more holistic view.

Samson and Ndefru (2024) examined the relationship between financial inclusion and community empowerment in Turkana County, Kenya. Using community echelon theory, the study assessed how financial inclusion impacts employment, education, and poverty reduction in marginalised areas. Results showed that financial services improved access to employment and education opportunities, but challenges such as cultural norms, peer pressure, and insecurity hindered financial inclusion efforts. The study was limited by its focus on community empowerment rather than SME sustainability, leaving a gap in understanding how SMEs in marginalised areas can leverage financial inclusion for long-term business growth.

Simiyu et al. (2024) explored the role of working capital management (WCM) on the financial performance of SMEs. The study conducted a literature review to identify factors such as credit management, asset-liability monitoring, and cost minimization as critical to SME survival. Findings indicated that effective WCM reduces financial distress, but poor credit management often leads to SME failure. However, the study relied solely on secondary data, lacking empirical validation through primary surveys or case studies. Future research should incorporate firm-level financial data to measure the direct impact of WCM practices on SME sustainability.

Mutiiria et al. (2024) analyzed financial development and inclusive growth in Kenya over the period 2000-2022. Using an inclusiveness matrix and regression models, the study found that bank deposits and private-sector credit positively impact financial inclusion. However, the study identified a low level of equity growth, implying that financial benefits are not evenly distributed. While the study effectively quantified financial inclusion metrics, it did not explore how financial development specifically affects SMEs. Further studies should assess how SMEs in different sectors benefit from financial expansion efforts.

Chepkorir et al. (2024) examined financial deepening and its effect on private investment in Kenya. The study found that private sector credit, broad money supply, and bank deposits significantly influence investment decisions. However, despite financial deepening, SME credit accessibility remains low due to stringent lending conditions. The study used an ARDL model, but its reliance on macroeconomic data ignored firm-level financial behaviours, leaving a gap in understanding how financial deepening directly affects SME sustainability.

Maina and Nyamasege (2024) explored the impact of fintech innovations on financial inclusion in Kenya's banking sector. The study focused on mobile banking and digital transactions, finding that mobile money significantly enhances financial access in rural areas. However, while fintech adoption is high, regulatory uncertainties and cybersecurity risks pose challenges. The study did not explore how fintech impacts SME credit accessibility and long-term sustainability, creating a gap in understanding how digital finance tools improve SME resilience.

Rwigamba and Gathiru (2024) studied financial record-keeping and sustainable growth of agribusiness enterprises in Rwanda. The study adopted a mixed-methods research design and surveyed 80 respondents from Moozay's Dairy and Crop Farm Ltd. Findings revealed that purchase bookkeeping ($\beta = 0.248$, $p = 0.010$), sales bookkeeping ($\beta = 0.330$, $p = 0.001$), and cash bookkeeping ($\beta = 0.337$, $p = 0.001$) significantly influence SME growth. The study emphasised that financial transparency and structured record-keeping are critical for SME sustainability. However, the research focused only on agribusiness, leaving gaps in understanding financial record-keeping across diverse industries.

Sikubwabo (2024) evaluated business policies and strategies for competitive advantage in Rwanda's fintech sector. The study sampled 150 fintech professionals using a stratified approach.

Findings showed that current business policies ($\beta = 0.276$, $p < 0.01$), differentiation strategies ($\beta = 0.426$, $p < 0.01$), and market challenges ($\beta = 0.355$, $p < 0.01$) significantly influence competitive advantage. However, fintech firms face regulatory constraints and limited funding, hindering sustainable growth. The study recommended that policymakers create more flexible financial regulations and promote digital innovation.

Swain and Nsabimana (2024) explored financial inclusion and nutrition among rural households in Rwanda, linking financial access to business sustainability. Using household survey data, findings revealed that formal financial institutions significantly improve food security and financial resilience. However, informal institutions like tontines were ineffective in improving SME financial stability. The study recommended expanding formal financial inclusion initiatives to rural areas to enhance economic resilience.

Fundji (2024) analysed the impact of financial inclusion on economic growth in East, West, and Southern Africa, including Rwanda. The study employed fully modified ordinary least squares regression and found that financial inclusion has a statistically significant effect on economic growth. However, results varied based on income levels, with high-income countries benefiting more from financial inclusion than low-income countries. The study recommended tailored financial literacy programs and policy-driven financial access solutions.

Umar et al. (2024) examined the impact of digital finance on SME financial inclusion in Africa, using data from 17 African countries. Findings showed that digital finance significantly improves SME access to financial services. However, regulatory barriers, cybersecurity risks, and lack of financial literacy hinder full adoption. The study did not analyze how business growth moderates financial inclusion, creating a gap in understanding how expanding SMEs leverage digital finance for sustainability.

Adato and Onsare (2024) examined financial management barriers affecting SME sustainability in Ethiopia and other developing countries. The study revealed that poor financial literacy among SME owners and managers, weak financial planning, and inefficient capital allocation are major constraints to SME survival. Using a meta-analysis approach, findings indicated that financial management remains underdeveloped, particularly in Ethiopia, where lack of financial education and policy inefficiencies limit SME growth. The study, however, did not explore the role of business growth as a moderator between financial inclusion and sustainability, highlighting the need for research on how business expansion impacts SME financial management effectiveness.

Abdissa et al. (2022) analyzed the determinants of SME growth in Ethiopia, emphasizing political instability, corruption, and the COVID-19 pandemic as significant barriers. Using multiple regression analysis, the study found that regulatory uncertainty, high taxation, and weak institutional frameworks negatively impact SME sustainability. While financial accessibility was recognized as a key determinant, the study failed to examine how business growth moderates financial inclusion's impact on SME resilience, creating a gap in understanding how expanding SMEs navigate financial barriers in an unstable environment.

Iwara (2024) explored financial inclusion challenges in rural South Africa and proposed a point-of-sale (PoS) business model to enhance SME financial access. Findings indicated that rural SMEs face significant barriers such as infrastructure deficits, low banking penetration, and limited digital finance adoption. However, while the study identified financial inclusion challenges, it did not examine how business growth moderates financial access, leaving a gap in understanding how SME expansion affects financial service utilization.

Literature Gap

Within the Nigerian literature, several works examine fintech adoption and access to credit but fail to contextualize findings by firm maturity or scalability (Omenihu et al., 2024). Studies also tend to conflate microenterprises with SMEs, despite their vastly different needs and capabilities. As a result, policy prescriptions often lack the precision required to support high-growth enterprises or firms transitioning from informal to formal financial systems (Omenihu et al., 2024).

Most empirical analyses in Nigeria continue to adopt descriptive or qualitative designs, limiting the ability to draw robust causal inferences between financial inclusion and SME performance. The absence of rigorous quantitative methods, such as structural equation modeling (SEM) or dynamic panel models, restricts understanding of moderating variables like business growth (Adegbite & Machethe, 2020). Incorporating these advanced techniques will provide actionable insights into how financial access mechanisms vary across SMEs based on growth patterns (Adegbite & Machethe, 2020).

Geographically, regional variations in financial access are frequently overlooked in national analyses. While SMEs in metropolitan areas benefit from fintech and banking innovations, those in North Central Nigeria continue to struggle with infrastructural and policy barriers (Agbim, 2020). Current literature rarely accounts for these disparities, resulting in generalizations that obscure local realities. There is a need for region-specific research that considers local infrastructure, financial institutions, and SME demographics (Agbim, 2020).

Additionally, concepts like banking diversity, insurance uptake, and affordable credit have not been sufficiently examined as strategic levers within the SME ecosystem. While digital platforms are expanding, their actual usage by different SME segments—especially those experiencing growth—is still not well understood (Okere et al., 2023). More nuanced studies are required to assess how growing firms interact with and benefit from varied financial services beyond traditional banking (Okere et al., 2023).

In conclusion, the current literature fails to adequately model the interaction between financial inclusion and business growth as a determinant of SME sustainability. Without distinguishing between static and dynamic enterprises, most studies offer incomplete guidance for financial policymakers and development institutions. This study addresses that gap by explicitly examining how business growth moderates financial inclusion’s impact on operational efficiency and long-term SME resilience in North Central Nigeria.

METHODOLOGY

This study adopted a quantitative, cross-sectional research design to examine the moderating effect of business growth on the relationship between financial inclusion and SME sustainability in North Central Nigeria. This study focused on small and medium enterprises (SMEs) operating in North Central Nigeria, specifically in Benue, Nasarawa, Kogi, Kwara, Niger, Plateau, and the Federal Capital Territory (FCT) Abuja). According to the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN, 2023), the total population will comprise 119,851 small enterprises and 10,011 medium enterprises, making a combined total of 129,862 SMEs across the selected states. These businesses will be drawn from various sectors, including manufacturing, trade, agriculture, services, and technology, which are essential in contributing to economic development and employment generation in the region. Yamane's (1967) formula for sample size determination was applied.Thus, the initial sample size **is 399**.

Stratified Sample Allocation for Small Enterprises Using Bowley's Proportional Allocation Formula

State	Small Enterprises (N_{small})	Sample Size for Small Enterprises (n_{small})
Benue	13,271	$\frac{13,271}{129,862} \times 479 \approx 49$
Nasarawa	10,163	$\frac{10,163}{129,862} \times 479 \approx 38$
Kogi	12,078	$\frac{12,078}{129,862} \times 479 \approx 44$
Kwara	24,752	$\frac{24,752}{129,862} \times 479 \approx 91$
Niger	22,092	$\frac{22,092}{129,862} \times 479 \approx 81$
Plateau	19,087	$\frac{19,087}{129,862} \times 479 \approx 76$
FCT Abuja	18,408	$\frac{18,408}{129,862} \times 479 \approx 71$

Source: Authors' Computation, 2025

For each state, the sample for medium enterprises is calculated as:

Stratified Sample Allocation for Medium Enterprises Using Bowley's Proportional Allocation Formula

State	Medium Enterprises (N_{medium})	Sample Size for Medium Enterprises (n_{medium})
Benue	1,580	$\frac{1,580}{129,862} \times 479 \approx 6$
Nasarawa	565	$\frac{565}{129,862} \times 479 \approx 2$
Kogi	439	$\frac{439}{129,862} \times 479 \approx 2$
Kwara	604	$\frac{604}{129,862} \times 479 \approx 2$
Niger	1,105	$\frac{1,105}{129,862} \times 479 \approx 4$
Plateau	2,265	$\frac{2,265}{129,862} \times 479 \approx 8$

FCT Abuja	4,453	$\frac{4,453}{129,862} \times 479 \approx 16$

Source: Authors' Computation, 2025

This study utilized a structured questionnaire as the primary instrument for collecting data on the interconnected dynamics of financial inclusion, business growth, and SME sustainability in North Central Nigeria. The study's model assessed the direct effect of financial inclusion on SME sustainability, while also examining the moderating role of business growth. The study employed Structural Equation Modelling (SEM) using ADANCO to analyze the relationships between financial inclusion, business growth, and SME sustainability in North Central Nigeria. SEM is a robust multivariate statistical technique that allows for the simultaneous estimation of multiple relationships between observed and latent variables. This method is particularly suitable for the study as it enables the testing of complex mediation and moderation effects, ensuring a more comprehensive understanding of how business growth influences the relationship between financial inclusion and SME sustainability.

RREULTS AND DISCUSSION

The model's evaluation incorporated 13 hypotheses, drawing on path coefficients and effect sizes (f^2) to determine the significance and impact of each relationship. The results offer nuanced insights into the complex interplay between financial infrastructure, enterprise capacity, and firm-level outcomes in the Nigerian SME landscape.

The first hypothesis (H01) tested whether Affordable Banking Services (ABS) significantly affect Operational Efficiency (OE). The results indicated a non-significant path coefficient ($\beta = 0.014$; $f^2 = 0.000$), leading to the rejection of H01. This implies that affordability alone does not guarantee improved SME performance. While accessible banking is essential, it appears insufficient in isolation—possibly due to limitations in service quality, lack of integration with credit or insurance products, or the inability of firms to leverage affordable services for growth. This aligns with studies highlighting that affordability must be paired with financial literacy, trust, and service relevance to impact firm outcomes meaningfully.

Hypothesis H02 examined the effect of Banking Diversity (BD) on OE and was strongly supported ($\beta = 0.518$; $f^2 = 0.660$), representing the most influential predictor in the model. This suggests that SMEs engaging with diverse banking services—such as savings, credit, mobile banking, overdraft, and investment advisory—are more likely to operate efficiently. Diverse banking engagement likely increases SMEs' access to capital, facilitates better cash flow management, and enables risk hedging. These findings reinforce arguments from institutional finance literature that a variety of tailored services empower businesses to respond to dynamic market needs and resource challenges.

H03 tested the direct relationship between Business Growth (BG) and OE, which was accepted ($\beta = 0.435$; $f^2 = 0.425$). Business growth, measured by increases in market reach, staff strength, or turnover, was shown to have a significant positive influence on operational effectiveness. Growth enables scale efficiencies, increases bargaining power, and attracts better financial terms, all of which enhance process efficiency. These results suggest that growth is not just an outcome but also a catalyst for operational sophistication in SMEs.

In contrast, the effects of other financial inclusion constructs—Consumer Protection (CP), Financial Literacy (FL), Inclusive Credit Scoring (ICS), and Insurance Uptake (IU)—varied in strength. H04, which posited a significant relationship between CP and OE, was accepted ($\beta = 0.172$; $f^2 = 0.020$). This finding implies that SMEs that perceive a strong regulatory environment and transparent financial dealings tend to perform better. Trust in the financial system, when reinforced by adequate consumer protection, likely leads to increased formal sector participation and uptake of advanced financial products.

However, hypotheses H05 through H07—relating to FL ($\beta = -0.063$; $f^2 = 0.004$), ICS ($\beta = -0.037$; $f^2 = 0.001$), and IU ($\beta = -0.084$; $f^2 = 0.004$)—were all rejected. The negative coefficients are particularly interesting and counterintuitive, especially for financial literacy and credit scoring. A possible explanation is that literacy and scoring systems may not be tailored to SME realities or are poorly communicated, leading to misinterpretation or distrust. Similarly, the negative result for insurance uptake suggests that SMEs might view insurance as an unnecessary cost rather than a risk mitigation tool, possibly due to past negative experiences, lack of awareness, or delays in claim settlements. These findings align with the view that formal financial mechanisms often fail to resonate with the informal realities of small enterprises in emerging markets unless supported by education, customisation, and enforcement.

The moderation hypotheses (H08 to H13) tested whether business growth amplifies or weakens the effect of the financial inclusion variables on operational efficiency. H08, which assessed the moderating effect of BG on CP, was accepted ($\beta = 0.090$; $f^2 = 0.005$), suggesting that as firms grow, the importance of consumer protection increases. Growth likely leads SMEs to interact more frequently with financial institutions, making protection mechanisms more visible and impactful. Similarly, H13, examining BG's moderation of IU, was also accepted ($\beta = 0.124$; $f^2 = 0.009$), indicating that growing businesses are more likely to benefit from insurance products as their risk exposure increases.

However, H09 (BG x FL), H10 (BG x ICS), H11 (BG x BD), and H12 (BG x ABS) were all rejected, with weak and mostly negative coefficients. The rejection of H09 ($\beta = -0.122$) and H10 ($\beta = -0.073$) suggests that business growth might actually diminish the influence of financial literacy and credit scoring on operational performance. This could mean that as SMEs grow, they rely more on internal capacity, social capital, or experiential learning, and less on formal literacy or standardised credit assessments. Similarly, the rejection of H11 and H12 implies that banking diversity and affordability do not significantly change their impact in the presence of growth. This reveals that the benefits of financial services may plateau or become less sensitive to firm growth, possibly due to diminishing marginal returns or bottlenecks in financial service delivery.

Table: Summary of Hypotheses

Hypothesis	Statement	Results
H01	Affordable Banking Services (ABS) has a significant effect on Operational Efficiency (OE).	Rejected ($\beta = 0.014$, $f^2 = 0.000$)
H02	Banking Diversity (BD) has a significant effect on Operational Efficiency (OE).	Accepted ($\beta = 0.518$, $f^2 = 0.660$)
H03	Business Growth (BG) has a significant effect on Operational Efficiency (OE).	Accepted ($\beta = 0.435$, $f^2 = 0.425$)
H04	Consumer Protection (CP) has a significant effect on Operational Efficiency (OE).	Accepted ($\beta = 0.172$, $f^2 = 0.020$)
H05	Financial Literacy (FL) has a significant effect on Operational Efficiency (OE).	Rejected ($\beta = -0.063$, $f^2 = 0.004$)
H06	Inclusive Credit Scoring (ICS) has a significant effect on Operational Efficiency (OE).	Rejected ($\beta = -0.037$, $f^2 = 0.001$)
H07	Insurance Uptake (IU) has a significant effect on Operational Efficiency (OE).	Rejected ($\beta = -0.084$, $f^2 = 0.004$)
H08	Business Growth moderates the effect of CP on OE (BG x CP → OE).	Accepted ($\beta = 0.090$, $f^2 = 0.005$)
H09	Business Growth moderates the effect of FL on OE (BG x FL → OE).	Rejected ($\beta = -0.122$, $f^2 = 0.013$)
H10	Business Growth moderates the effect of ICS on OE (BG x ICS → OE).	Rejected ($\beta = -0.073$, $f^2 = 0.004$)
H11	Business Growth moderates the effect of BD on OE (BG x BD → OE).	Rejected ($\beta = -0.044$, $f^2 = 0.005$)
H12	Business Growth moderates the effect of ABS on OE (BG x ABS → OE).	Rejected ($\beta = -0.025$, $f^2 = 0.001$)
H13	Business Growth moderates the effect of IU on OE (BG x IU → OE).	Accepted ($\beta = 0.124$, $f^2 = 0.009$)

Source: Researcher's analysis, 2025

The overall R^2 value of 0.780 indicates that the model explains 78% of the variance in operational efficiency, confirming its high predictive power. In particular, the large effect sizes of BD and BG, combined with model fit indices such as SRMR = 0.054 and NFI = 0.818, confirm that the structural model is robust and well-fitted to the data.

CONCLUSION AND RECOMMENDATIONS

The findings of this study lead to an important conclusion: financial inclusion has the potential to enhance SME operational efficiency in North Central Nigeria, but its effects are neither uniform nor automatic. Among the dimensions considered, Banking Diversity and Business Growth stand out as decisive factors. SMEs that access a wider range of financial services are more resilient, efficient, and adaptive, while firms experiencing growth are more likely to formalise practices, exploit financial opportunities, and achieve economies of scale. In conclusion, financial inclusion

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is not a one-size-fits-all solution for SMEs. Its success depends on the diversity of services available, the robustness of consumer protection, and the growth trajectory of enterprises. For policymakers and practitioners, the challenge lies in ensuring that financial inclusion policies are embedded in broader strategies of SME development and are responsive to the evolving realities of enterprise growth.

Based on the findings, several recommendations can be advanced. First, policymakers should prioritise enhancing Banking Diversity by promoting a range of products that cater to SMEs at different stages of development, including savings, credit, digital platforms, and advisory services. Financial institutions should be encouraged to innovate and deliver flexible, context-appropriate solutions that go beyond affordability to address usability and reliability. Second, strengthening Consumer Protection frameworks is essential. Regulators must ensure that SMEs can engage with financial systems without fear of exploitation or non-transparency. Stronger enforcement of fair practice laws, quicker grievance mechanisms, and education campaigns on rights and responsibilities can build trust and increase uptake of financial services. Third, programmes that address the weaknesses of Financial Literacy, Inclusive Credit Scoring, and Insurance Uptake need to be recalibrated. Literacy initiatives should be more practical, experiential, and SME-focused, rather than generic. Credit scoring systems must integrate informal credit histories and SME realities, while insurance providers should design products that are affordable, accessible, and responsive to business risks. Finally, interventions must be growth-sensitive. As firms expand, their financial needs evolve, and policies should reflect this dynamism. Tiered financial inclusion strategies that distinguish between micro, small, and medium firms will ensure that the tools offered remain relevant, thereby maximising their contribution to operational efficiency and sustainability.

REFERENCES

Abdullahi, A., & Othman, A. H. A. (2021). Financial inclusion enhancement through the adoption of Islamic microfinance in Nigeria. *International Journal of Ethics and Systems*. https://doi.org/10.1108/ijoes-02-2021-0040

Addy, W. A., Ofodile, O. C., Adeoye, O. B., Oyewole, A. T., Okoye, C. C., Odeyemi, O., & Ololade, Y. J. (2024). Data-driven sustainability: How FinTech innovations are supporting green finance. *Engineering Science & Technology Journal*. https://doi.org/10.51594/estj.v5i3.871

Adegbite, O., & Machethe, C. (2020). Bridging the financial inclusion gender gap in smallholder agriculture in Nigeria: An untapped potential for sustainable development. *World Development, 127*, 104755. https://doi.org/10.1016/j.worlddev.2019.104755

Adegbite, O., Machethe, C., & Anderson, C. L. (2021). Revisiting the measurement of financial inclusion of rural smallholder farmers in Nigeria. *Agricultural Finance Review*. https://doi.org/10.1108/AFR-07-2020-0099

Adegboye, A., & Iweriebor, S. (2023). Does access to finance enhance SME innovation and productivity in Nigeria? *African Development Review*. https://doi.org/10.1111/1467-8268.12351

Agarwal, S., Alok, S., Ghosh, P., & Gupta, S. (2019). Financial inclusion and alternate credit scoring: Role of big data and machine learning in fintech. *FEN: Behavioral Finance (Topic)*. https://doi.org/10.2139/ssrn.3507827

Agbim, K. C. (2020). Government policy, financial inclusion and performance of SMEs in South Eastern Nigeria. *International Economic Review,* 6(2), 69–82. https://doi.org/10.15678/IER.2020.0602.05

Ahmad, I., Alni, R., Arni, S., & Mamduh, H. M. (2023). Financial literacy to improve sustainability: A bibliometric analysis. *Studies in Business and Economics, 18*(2), 24–43. https://doi.org/10.2478/sbe-2023-0043

Aitken, R. (2017). ‘All data is credit data’: Constituting the unbanked. *Competition & Change, 21*(3), 274–300. https://doi.org/10.1177/1024529417712830

Ali, E., Anshari, M., Hamdan, M., Ahmad, N., & Surieshtino, Y. (2023). Green finance for sustainable development: A bibliographic analysis. *2023 International Conference on Sustainable Islamic Business and Finance (SIBF),* 46–49. https://doi.org/10.1109/SIBF60067.2023.10379915

Babajide, A., Osabuohien, E., Tunji-Olayeni, P., et al. (2024). Financial literacy, financial capabilities, and sustainable business model practice among small business owners in Nigeria. *Journal of Sustainable Finance & Investment, 13*(3), 1670–1692. https://doi.org/10.1080/20430795.2021.1962663

Babajide, A., Osabuohien, E., Tunji-Olayeni, P., Falola, H., Amodu, L., Olokoyo, F., Adegboye, F., & Ehikioya, B. (2021). Financial literacy, financial capabilities, and sustainable business model practice among small business owners in Nigeria. *Journal of Sustainable Finance & Investment, 13*(7), 1670–1692. https://doi.org/10.1080/20430795.2021.1962663

Bagreeva, E., & Barakina, E. (2019). Improving the system of consumer protection in the Russian market in the context of achieving leadership in digitalization. *Proceedings of the 4th International Conference on Social, Business, and Academic Leadership (ICSBAL 2019)*. https://doi.org/10.2991/icsbal-19.2019.20

Bojadzievska-Danevska, A. (2024). Investigating the relation between FinTech and sustainable banking. *Entrepreneurship, 12*(1). https://doi.org/10.37708/ep.swu.v12i1.5

Burchi, A., Włodarczyk, B., Szturo, M., & Martelli, D. (2021). The effects of financial literacy on sustainable entrepreneurship. *Sustainability, 13*(9), 5070. https://doi.org/10.3390/SU13095070

Carayannis, E., Grigoroudis, E., Sindakis, S., & Walter, C. (2014). Business model innovation as antecedent of sustainable enterprise excellence and resilience. *Journal of the Knowledge Economy, 5*, 440–463. https://doi.org/10.1007/s13132-014-0206-7

Chaturvedi, R., Darokar, H., Patil, P. P., Kumar, M., Sangeeta, K., Aravinda, K., & Kadhim, A. A. (2023). Maximizing towards the sustainability: Integrating materials, energy, and resource efficiency in revolutionizing manufacturing industry. *E3S Web of Conferences*. https://doi.org/10.1051/e3sconf/202345301036

Danladi, S., Prasad, M., Modibbo, U. M., Ahmadi, S. A., & Ghasemi, P. (2023). Attaining sustainable development goals through financial inclusion: Exploring collaborative approaches to fintech adoption. *Sustainability*, 15(17), 13039. https://doi.org/10.3390/su151713039

Dimnwobi, S. K., Madichie, C. V., Ekesiobi, C. S., & Asongu, S. (2023). Financial development and renewable energy consumption in Nigeria. *Renewable Energy*. https://doi.org/10.1016/j.renene.2022.04.150

Effiom, L., & Edet, S. (2020). Financial innovation and the performance of small and medium scale enterprises in Nigeria. *Journal of Small Business & Entrepreneurship, 34*, 141–174. https://doi.org/10.1080/08276331.2020.1779559

Gorondutse, A. H., Arshad, D., & Alshuaibi, A. S. I. (2020). Driving sustainability in SMEs' performance: The effect of strategic flexibility. *Journal of Strategy and Management*. https://doi.org/10.1108/JSMA-03-2020-0064

Gould, B. G. B. (2024). The role of consumer empowerment and its comparison in financial inclusion in the Global South. *Asian Journal of Economics, Business and Accounting*. https://doi.org/10.9734/ajeba/2024/v24i121615

Grady, R. (2012). Consumer protection in the financial sector: Recent regulatory developments. *Jassa—the Finsia Journal of Applied Finance*, (36). https://consensus.app/papers/consumer-protection-in-the-financial-sector-recent-grady/45641d52057b5a31a1331c0bae340b00/?utm_source=chatgpt

Huang, L. (2024). Green bonds and ESG investments: Catalysts for sustainable finance and green economic growth in resource-abundant economies. *Resources Policy*. https://doi.org/10.1016/j.resourpol.2024.104806

Huang, S., Cheng, M., & Shu, Z. (2024). Role of social capital and financial inclusion in sustainable economic growth. *Research in International Business and Finance, 67*, 102525. https://doi.org/10.1016/j.ribaf.2024.102525

Ibrahim, S. S., & Aliero, H. M. (2020). Testing the impact of financial inclusion on income convergence: Empirical evidence from Nigeria. *African Development Review*. https://doi.org/10.1111/1467-8268.12413

Iftikhar, R., Ashfaq, M., Akhtar, S., Frimpong, S. E., & Iftikhar, R. (2024). Empowering sustainable development: The role of financial literacy and social capital in bridging financial inclusion in developing nations. *Journal of Innovative Research in Management Sciences*. https://doi.org/10.62270/jirms.v5i2.79

Jima, M. D., & Makoni, P. (2023). Causality between financial inclusion, financial stability and economic growth in Sub-Saharan Africa. *Sustainability*, 15(2), 1152. https://doi.org/10.3390/su15021152

Katchasuwanmanee, K., Cheng, K., & Bateman, R. (2016). Simulation based energy-resource efficient manufacturing integrated with in-process virtual management. *Chinese Journal of Mechanical Engineering*, *29*, 1083–1089. https://doi.org/10.3901/CJME.2016.0714.080

Khémiri, W., Attia, E., & Chafai, A. (2024). How financial inclusion moderates the curvilinear nexus between tangible investment and sustainable firm growth: New evidence from the Middle East and North Africa Region. *Sustainability, 16*(6), Article 2573. https://doi.org/10.3390/su16062573

Khoiruddin, M., Rahmah, N., & Utami, T. (2023). Analysis of sustainability and inclusive strategies in achieving profitability: Studies on banking listed on the Indonesia Stock Exchange. *International Journal of Multidisciplinary Research and Analysis*. https://doi.org/10.47191/ijmra/v6-i8-62

Li, Z., & Qamruzzaman, M. (2023). Nexus between environmental degradation, clean energy, financial inclusion, and poverty. *Sustainability*, 15(19), 14161. https://doi.org/10.3390/su151914161

Liang, Y., Lu, X., Li, W., & Wang, S. (2018). Cyber physical system and big data enabled energy efficient machining optimisation. *Journal of Cleaner Production*. https://doi.org/10.1016/J.JCLEPRO.2018.03.149

Liu, H., Yao, P., Latif, S., Aslam, S., & Iqbal, N. (2021). Impact of green financing, FinTech, and financial inclusion on energy efficiency. *Environmental Science and Pollution Research*, *29*, 18955–18966. https://doi.org/10.1007/s11356-021-16949-x

Lobozynska, S., Skomorovych, I., & Vladychyn, U. (2020). State policy of consumer protection in the digital financial services market in Ukraine. *Finanse i Prawo Finansowe*. https://doi.org/10.18778/2391-6478.S.2021.05

Machikape, K., & Oluwadele, D. (2024). Advancing financial inclusion and data ethics: The role of alternative credit scoring. In *Lecture Notes in Computer Science* (Vol. 14422, pp. 229–241). https://doi.org/10.1007/978-3-031-71412-2_17

Malady, L. (2016). Consumer protection issues for digital financial services in emerging markets. *Banking & Insurance eJournal*. https://doi.org/10.2139/SSRN.3028371

Mhlanga, D. (2022). The role of financial inclusion and FinTech in addressing climate-related challenges in the industry 4.0: Lessons for sustainable development goals. *Frontiers in Climate, 4*. https://doi.org/10.3389/fclim.2022.949178

Mirza, N., Umar, M., Afzal, A., & Firdousi, S. (2023). The role of FinTech in promoting green finance, and profitability: Evidence from the banking sector in the Eurozone. *Economic Analysis and Policy*. https://doi.org/10.1016/j.eap.2023.02.001

Njuguna, R., & Sowon, K. (2021). Poster: A scoping review of alternative credit scoring literature. *ACM SIGCAS Conference on Computing and Sustainable Societies*. https://doi.org/10.1145/3460112.3471972

Ochinanwata, N., Ezepue, P., Nwankwo, T. C., Ochinanwata, C., & Igwe, P. (2021). Public–private entrepreneurial financing partnership model in Nigeria. *Thunderbird International Business Review*, *63*(6), 743–755. https://doi.org/10.1002/tie.22194

Okere, K., Ibe, G. I., Muoneke, O., & Nwaeze, N. (2023). Environmental sustainability, small and medium enterprises, and finance in Africa: A triplicate relationship. *Environmental Science and Pollution Research*, 30, 41359–41378. https://doi.org/10.1007/s11356-022-25012-2

Olaleye, B. R., Lekunze, J., Sekhampu, T. J., Khumalo, N., & Ayeni, A. A. W. (2024). Leveraging innovation capability and organizational resilience for business sustainability among SMEs: A PLS-SEM approach. *Sustainability, 16*(21), 9201. https://doi.org/10.3390/su16219201

Omenihu, C. M., Brahma, S., Katsikas, E., et al. (2024). Financial inclusion and poverty alleviation: A critical analysis in Nigeria. *Sustainability, 16*(9), Article 8528. https://doi.org/10.3390/su16198528

Omenihu, C. M., Brahma, S., Katsikas, E., Vrontis, D., Siachou, E., & Krasonikolakis, I. (2024). Financial inclusion and poverty alleviation: A critical analysis in Nigeria. *Sustainability, 16*(19), 8528. https://doi.org/10.3390/su16198528

Paspalj, D. (2025). Managerial styles and digital innovation for sustainable business growth. *Journal of Agronomy, Technology and Engineering Management (JATEM)*. https://doi.org/10.55817/tnen6732

Patel, A., & Satapathy, S. (2023). Empowering digital banking services and enhancing financial inclusion using smart and robust fintech software solutions. *2023 World Conference on Communication & Computing (WCONF)*, 1–9. https://doi.org/10.1109/WCONF58270.2023.10235246

Pratiwi, L. R. E., & Krisnawati, A. (2021). The role of digital consumer protection in mediating the effect of mobile money usage towards financial inclusion. *International Journal of Science and Management Studies (IJSMS)*. https://doi.org/10.51386/25815946/ijsms-v4i5p116

Rahmati, A. (2024). The synergy between fintech and Islamic banking: Expanding access to financial inclusion. *Al Mashaadir: Jurnal Ilmu Syariah*. https://doi.org/10.52029/jis.v5i1.215

Razavi, R., & Elbahnasawy, N. G. (2025). Unlocking credit access: Using non-CDR mobile data to enhance credit scoring for financial inclusion. *Finance Research Letters*. https://doi.org/10.1016/j.frl.2024.106682

Razavi, R., & Elbahnasawy, N. G. (2025). Unlocking credit access: Using non-CDR mobile data to enhance credit scoring for financial inclusion. *Finance Research Letters*. https://doi.org/10.1016/j.frl.2024.106682

Saini, A. (2024). Digital finance-fintech and its impact on financial inclusion in India. *International Journal of Innovative Science and Research Technology (IJISRT)*. https://doi.org/10.38124/ijisrt/ijisrt24apr2261

Senaya, G. M. (2024). Financial literacy and its role in promoting sustainable investment. *World Journal of Advanced Research and Reviews*. https://doi.org/10.30574/wjarr.2024.24.1.2986

Simumba, N., Okami, S., Kodaka, A., & Kohtake, N. (2021). Spatiotemporal integration of mobile, satellite, and public geospatial data for enhanced credit scoring. *Symmetry, 13*(4), 575. https://doi.org/10.3390/sym13040575

Singh, A., & Sharma, L. M. (2023). Fintech and financial inclusion: Transforming underserved access to financial services. *International Journal of Tourism and Hotel Management*. https://doi.org/10.22271/27069583.2023.v5.i2a.71

Soetan, T. O., Mogaji, E., & Nguyen, N. P. (2021). Financial services experience and consumption in Nigeria. *Journal of Services Marketing*. https://doi.org/10.1108/JSM-07-2020-0280

Spescha, A., & Woerter, M. (2019). Innovation and firm growth over the business cycle. *Industry and Innovation, 26*(3), 321–347. https://doi.org/10.1080/13662716.2018.1431523

Sun, Y., Gozgor, G., Lau, C.-K., & Soliman, A. M. (2024). Inclusive finance and sustainability: The dynamic spillover effects of uncertainties on access to credit. *Research in International Business and Finance*. https://doi.org/10.1016/j.ribaf.2024.102628

Surminski, S., & Oramas-Dorta, D. (2014). Flood insurance schemes and climate adaptation in developing countries. *International Journal of Disaster Risk Reduction, 7*, 154–164. https://doi.org/10.1016/j.ijdrr.2013.10.005

Tebo, P. V. (2005). Building business value through sustainable growth. *Research-Technology Management, 48*(5), 28–32. https://doi.org/10.1080/08956308.2005.11657335

Turner, D. (2023). Consumer protection and good customer outcomes in an evolving financial services ecosystem. *Journal of Financial Compliance*. https://doi.org/10.69554/xebr3464

Vuong, G. T. H., Barky, W., & Nguyen, M. H. (2024). Stabilizing the national banking system through digital financial inclusion, creative innovations, and green finance in low-financially developed economies. *Journal of Open Innovation: Technology, Market, and Complexity*. https://doi.org/10.1016/j.joitmc.2024.100434

Yang, C., & Masron, T. A. (2022). Impact of digital finance on energy efficiency in the context of green sustainable development. *Sustainability*. https://doi.org/10.3390/su141811250

Yu, L., & Aleksandrova, M. V. (2021). Weather index insurance: Promises and challenges of promoting social and ecological resilience to climate change. *Discussion Paper*. https://doi.org/10.23661/BP14.2021

Zhang, R. (2025). Green finance and ESG investment strategies under climate risk management. *Economics and Management Innovation*. https://doi.org/10.71222/00d71j98

Zhu, K., & Guo, L. (2023). Financial technology, inclusive finance and bank performance. *Finance Research Letters*. https://doi.org/10.1016/j.frl.2023.104872