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FINTECH, FINANCIAL INCLUSION AND ENTERPRISE DEVELOPMENT IN NORTHEAST NIGERIA: DRIVERS, CONSTRAINTS AND OUTCOMES

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Abstract

This study investigates the transformative role of financial technology (Fintech) in advancing financial inclusion and enterprise development within the conflict-affected and economically marginalized region of Northeast Nigeria. The main objective is to examine the relationship between fintech adoption—encompassing mobile money, digital payments, and micro-credit—and the growth outcomes of Micro, Small, and Medium Enterprises (MSMEs) across the six states of the region. Employing a cross-sectional, explanatory mixed-methods design, the study utilized a structured survey of MSMEs for quantitative analysis and key-informant interviews with regulators, fintech providers, and association leaders for qualitative context. Structural Equation Modelling (SEM) was applied to validate measurement models and estimate the structural relationships among the latent constructs of fintech adoption, financial inclusion, and enterprise development. The findings reveal that fintech adoption significantly and positively influences financial inclusion, which in turn acts as a critical intermediary driving enterprise development by improving liquidity, transaction efficiency, and credit access. However, the results also highlight that the effectiveness of these digital tools is significantly moderated by environmental constraints, specifically ongoing insecurity, infrastructural deficits, and low levels of digital literacy among entrepreneurs. Based on these findings, the study recommends that the Central Bank of Nigeria and regional stakeholders prioritize the strengthening of digital infrastructure and implement targeted digital literacy training programs to bridge the usage gap. For further study, it is suggested that longitudinal research be conducted to track the long-term resilience of fintech-integrated MSMEs as they transition from informal to formal economic sectors. The primary limitations of the study include the volatile security situation in certain rural pockets of the Northeast, which restricted physical data collection in specific high-risk zones, and the reliance on self-reported business performance data from informal MSMEs.

Keywords: Fintech Adoption, Financial Inclusion, MSME Development, Structural Equation Modelling (SEM)

1. Introduction

Fintech is transforming how people and businesses manage money worldwide. It is evident in mobile money, digital payments, crowd funding, peer-to-peer loans, agent banking, and apps that help users save automatically. In developing countries, these tools are not just new technology – they are providing access to financial services for those who previously lacked it. This is making the financial system more open and inclusive, bringing more people into participation (Soriano, 2017).

The expansion of financial technology (fintech) has created new opportunities to improve financial inclusion and business growth in emerging economies. In Africa, technologies such as mobile money services, agent

banking, credit services, and savings services have transformed access to finance for segments of society that previously lacked access to mainstream banking (Danladi et al. 2023). The Nigerian economy, Africa's largest and home to one of the continent's most rapidly growing fintech markets, is a notable example. However, access to the benefits of this technology is not uniform across this diverse nation. This disparity is most evident in Northeastern Nigeria, which has long suffered from insurgency, poverty, environmental degradation, and limited access to financial services (Ediagbonya & Tioluwani, 2023).

Micro, Small, and Medium Enterprises (MSMEs) are the main drivers of economic activity in the Northeast region, contributing to job creation, value chain development within communities, and business and enterprise growth across the region. MSMEs in the Northeast continue to operate in highly challenging environments characterised by insecurity, limited access to formal credit, high transaction costs, and inadequate physical and information technology infrastructure (Abbas et al. 2025). The Central Bank of Nigeria (CBN) and other stakeholders have advocated the use of fintech as a tool to bridge financial gaps and enhance business development. Experience from other parts of Nigeria shows that access to digital financial services improves business productivity, market access, financial management, and access to microcredit (Soetan & Mogaji, 2024).

The Central Bank of Nigeria's drive for financial inclusion, together with the growth of mobile networks and digital banking, has created opportunities for people who previously lacked access to formal banking. However, not everyone benefits equally. Significant disparities exist between regions (Ladagu, 2020). The Northeast states such as Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe – lags behind the rest of the country in terms of financial inclusion.

People still do not fully understand how fintech, financial inclusion, and business growth are connected in regions experiencing conflict or instability. While fintech is often promoted as fast, user-friendly, and capable of reducing barriers, widespread adoption does not happen automatically. Actual uptake depends on various factors, including social pressures, local institutions, and security conditions (Usman, 2024). Therefore, to develop effective plans for Northeast Nigeria, it is necessary to examine what truly drives or hinders fintech adoption. It is equally important to assess how fintech-enabled financial inclusion impacts local businesses. Without this understanding, any strategy remains speculative.

Despite the rapid proliferation of financial technology (Fintech) across Nigeria, a significant "digital divide" persists, leaving the Northeast region—comprising Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe—largely excluded from the digital economic revolution. While Nigeria's national financial inclusion rate improved to approximately 64% in 2023, the Northeast continues to grapple with the highest exclusion rates in the country, often exceeding 45% in rural corridors (EFInA, 2023). This disparity is exacerbated by over a decade of insurgency, which has decimated physical banking infrastructure; recent data indicates that over 30% of bank branches in conflict-affected zones have either been destroyed or remain indefinitely closed, leaving Micro, Small, and Medium Enterprises (MSMEs) with no viable alternative to high-risk, cash-based transactions (Central Bank of Nigeria (CBN, 2024).

The core of the problem lies in the disconnect between fintech's theoretical potential and the harsh regional reality of "fragility traps." Although digital tools are touted as a panacea for MSME growth, small businesses in Northeast Nigeria operate under extreme constraints. Nationally, while 80% of MSMEs recognize digital payments as essential, only 22% of enterprises in the Northeast utilize them consistently due to frequent network outages and a 15% higher failure rate in digital transactions compared to the South-West (Abbas et al., 2025). Furthermore, the promise of digital credit remains unfulfilled; approximately 70% of MSMEs in the region remain invisible to automated lending algorithms because they lack the digital footprints required for credit scoring, largely due to their operation within informal, non-digital supply chains (Soetan & Mogaji, 2024).

Academic discourse frequently overlooks how environmental moderators such as conflict, displacement, and

systemic mistrust alter the efficacy of fintech. Current research (Siano et al., 2020; Aina, 2025) remains heavily skewed toward stable economic hubs like Lagos and Abuja, leaving a critical knowledge gap regarding the Northeast. In this region, low digital literacy is a formidable barrier, with nearly 60% of micro-entrepreneurs lacking the foundational skills to navigate mobile banking interfaces (Okeke et al., 2025). Without empirical evidence derived from robust methodologies like Structural Equation Modelling (SEM) to map the causal pathways between fintech adoption, inclusion, and enterprise development, policymakers are operating on speculation. Consequently, MSMEs in Northeast Nigeria face the risk of permanent economic marginalization, as they are unable to leverage the very technologies designed to foster resilience and sustainable growth in unstable markets.

This study examines the connections between fintech, financial inclusion, and business growth in Northeast Nigeria. Its objectives are to:

i. Closely analyse how MSMEs in the region use fintech, including its prevalence and the various ways it is adopted.

ii. Determine how fintech adoption relates to financial inclusion within these communities.

iii. Assess the impact of changes in financial inclusion on enterprise growth – does it truly make a difference?

iv. Identify the factors that drive or hinder fintech-driven financial inclusion.

v. Examine how conflict, infrastructure, and digital skills influence the relationship between fintech, financial inclusion, and enterprise growth do they facilitate progress or create obstacles?

Research Hypotheses

H1: When MSMEs in Northeast Nigeria use fintech, they experience a significant increase in financial inclusion.

H2: Improved financial inclusion leads to stronger enterprise development in the region.

H3: Financial inclusion acts as an intermediary, linking fintech adoption with enterprise development.

H4: Factors such as ongoing conflict, weak infrastructure, and low digital literacy significantly influence how fintech adoption impacts financial inclusion.

H5: Simply adopting fintech is not sufficient to drive enterprise development; it is effective only when other key factors are present.

Research Gap

People often discuss fintech and financial inclusion, but most research focuses on Nigeria's more stable, bustling areas such as Lagos, Abuja, or the South-West and South-South regions. Few studies examine what is happening in more challenging locations, like Northeast Nigeria, where conflict and weak infrastructure make everything more difficult. When researchers do investigate these areas, they usually concentrate on individual consumers and their use of digital finance, rather than on how small businesses integrate fintech into their daily operations. Even then, they rarely employ robust methods such as Structural Equation Modelling to determine what truly drives outcomes what is direct, what is indirect, and what obstacles exist in the context of fintech, financial inclusion, and businesses performance.

As a result, there is a significant gap in knowledge. We do not fully understand how fintech operates in fragile economies, or how conflict and difficult conditions alter the meaning of financial inclusion. We also lack a comprehensive understanding of what happens to small businesses when their access to finance changes. This study aims to address that gap. It provides new, local evidence from Northeast Nigeria, uses SEM to analyse the cause-and-effect relationships, and offers a clearer, more realistic perspective on what fintech can achieve for development – and where its limitations lie.

2. Literature Review

2.1 Conceptual Review

Fintech, Financial Inclusion and Enterprise Development

This review synthesises recent literature on the effects of financial technology (fintech) on financial inclusion and enterprise development worldwide. The argument structuring this literature appears straightforward but remains conditional: financial technology consistently improves access to and usage of core financial services (payment, account, transfer); however, the implications of financial technology for other aspects of enterprise development (investment, productivity growth, formalisation) remain uncertain and depend on additional factors (Ameziane, 2024). This overview highlights the literature's established knowledge and the points of divergence that require further rigorous investigation.

Fintech is digital payments (mobile money and wallets), agent networks, digital credit, crowdfunding, and platform financial intermediation. Financial inclusion: Ownership and use of financial products – accounts, payments, savings, loans, and insurance. Enterprise development: Business performance outcomes of entry, survival, sales, investment, employment, productivity growth, and formalisation at the establishment or business enterprise level among Micro, Small, and Medium-sized Enterprises (MSMEs) (Arner et al. 2020).

The literature presents two causal chains. The first concerns access to finance, stating that fintech reduces transaction and search costs, extends the availability of financial services (through agents and mobile technology), and increases the use of financial accounts. The second explanation offered by the literature is the transmission of the enterprise effects chain, which asserts that improved financial transactions and the provision of short-term financial liquidity (through digital credit and invoice financing) enhance the efficiency of working capital transactions and may increase investment and sales (Beck, 2020; Sreenu, 2024; Magableh et al. 2025). However, these causal transmissions depend on the state of credit depth and levels of financial literacy. Systematic reviews (Odei-Appiah et al.; 2022; Feyen et al. 2023; Hu et al. 2023) show that the impact of fintech on financial services usage is more significant than its effect on deep financial inclusion.

Extensive research (Lagna & Ravishankar, 2022; Cosma & Rimo, 2023; Bhat et al. 2024; Offiong et al. 2025), both internationally and within individual countries, demonstrates that mobile money and digital payments genuinely help more adults access formal financial services. Large studies, including meta-analyses of previous findings, show that when people have access to these tools, more of them own accounts and send or receive money through official channels. The size of these increases is not always substantial, but in favourable conditions, the change can range from a few percentage points to double digits. The impact depends on factors such as the speed of technology adoption, the ease of depositing and withdrawing funds, and the availability of mobile phone coverage and identification systems.

Some patterns frequently recur. For example, city dwellers usually benefit more than those in remote rural areas, unless there is a strong network of agents. There is also the issue of gender – women often register for mobile accounts less than men, typically due to cultural norms or challenges with digital skills (Ndione et al. 2024). Interoperability further complicates matters. Allowing people to transfer money across different platforms can reduce fees, but it may also discourage service providers from expanding their networks. Therefore, the overall impact on financial inclusion is not always clear-cut (Moreira-Santos, 2022).

Firm-level research such as surveys, panel data studies, and some quasi-experiments (Zarrouk et al. 2021; Adjasi et al. 2023; Passanisi, 2024; Chibueze et al. 2025) consistently shows that fintech provides MSMEs with significant benefits in their daily operations. Payments are processed more quickly. Businesses spend less time and money managing cash. Sending money to suppliers or workers becomes easier. Managing cash flow is less burdensome. These improvements are substantial: many empirical studies (Gabor & Brooks, 2020; Inoussa, 2021; Kim et al. 2021) report clear increases in sales and turnover, particularly for urban microenterprises and small shops that serve customers throughout the day. However, beyond these immediate gains, the long-term picture is less clear. Sustained increases in investment, larger loans for equipment, or lasting productivity

improvements do not appear as consistently. The literature discusses several reasons for this.

First, there is selection and measurement. Much of the researches (Shapiro et al. 2022; Albuainain & Ashby, 2025; Ha et al. 2025; Khalil et al. 2025) are observational, and the first businesses to adopt fintech were already more productive or better connected. If you are not careful, you may overstate the actual benefits. Then there is the reality of digital credit. Most available options are small, short-term loans with high costs. They help with day-to-day cash needs, but they are not the type of funding used to buy new machinery or expand. Policy reviews and practitioner reports (Buckley et al. 2021; Becha et al. 2025; Khalil et al. 2025) agree that digital credit reaches more firms, but it is not a real substitute for the longer-term finance needed for significant investments.

There are also deeper, structural obstacles. Weak property rights, unreliable credit bureaus, insufficient collateral, and limited management skills all make it difficult to translate payment access into real, long-term business growth. Some of the newer, higher-quality studies – using administrative transaction data and innovative quasi-experimental designs begin to reveal what is actually happening. Fintech helps informal firms survive and remain liquid in the short term. Better-connected SMEs experience more growth and develop stronger relationships with formal banks. However, the impact is not uniform; it depends on a firm's size, sector, and digital readiness (Thomas & Hedrick-Wong, 2020).

Empirical studies and policy reviews (Gershenson et al. 2021; Pizzi et al. 2021; Gu et al. 2023; Koloseni & Mandari, 2024) consistently highlight a few key factors that make a significant difference: agent networks and last-mile infrastructure are crucial. People require physical access points – agents – as well as reliable mobile and data coverage, particularly in rural areas. The data are clear: regions with more agents see higher account use. Interoperability and fair pricing are also important. When different systems are compatible and transaction costs are reasonable, more people participate and use the services. However, systems must be carefully designed to maintain market competition and ensure coverage is accessible to all.

Regulation must strike the right balance between encouraging innovation and protecting individuals. Simple licensing, testing new models in sandboxes, rules that align KYC requirements with risk, and strong consumer protections all build trust and support scaling. The World Bank (Pangestu, 2023) continues to highlight that the most effective policies enable fintech to support small businesses responsibly. Data ecosystems and reliable credit information can also create opportunities. When people leave digital footprints – such as transaction histories or platform activity – lenders can use this data to assess creditworthiness, even if someone lacks formal collateral. However, this is only effective if laws and privacy protections ensure data sharing is safe for everyone.

A research (Yakubi et al. 2021) identifies four major obstacles. First, there is the issue of infrastructure and connectivity. Without electricity or a reliable internet connection, fintech cannot reach people. Deploying services in areas with poor coverage is ineffective unless there is also investment in basic infrastructure. Next, there is the challenge of digital literacy and trust. People are reluctant to use new apps or digital wallets when they do not trust the providers or do not understand how these tools work. This divide particularly affects women in many regions.

Product design is another sticking point. Most digital credit products focus on short-term cash flow rather than supporting small business growth. Their pricing and terms do not align with what SMEs actually need. Finally, there are regulatory and systemic risks. Weak consumer protections and loopholes in anti-money laundering rules allow fraud and predatory lending. When problems arise, regulators often clamp down, which can make it more difficult for people to access the system (Meraj et al. 2025).

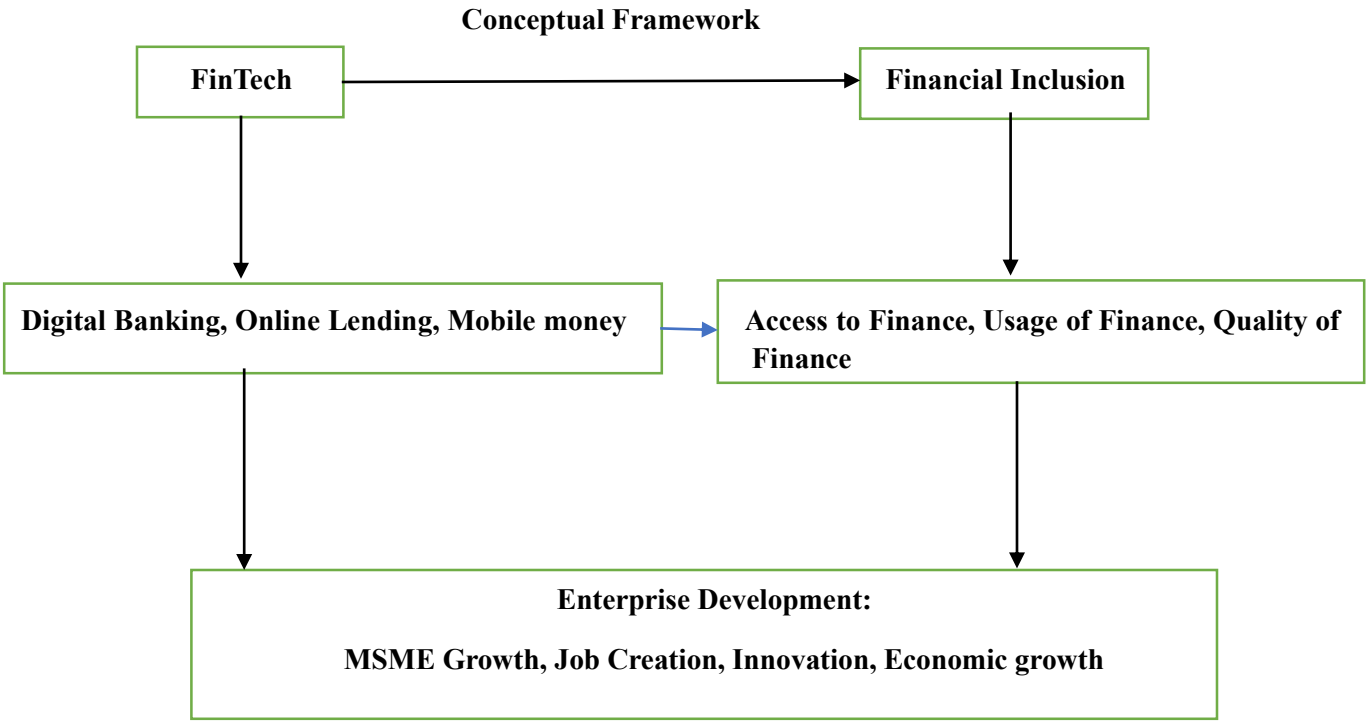

Fig. 1: Conceptual framework of the relationship: FinTech, Financial Inclusion & Enterprise Development

Source: Author's Computation, 2026

2.2 Empirical Review

Around the world, the same phenomenon exists. fintech is changing the way people and businesses handle money. Innovations such as mobile money, digital payments, peer-to-peer lending, crowdfunding, and digital banks are not just technology buzzwords – they are genuinely opening up financial opportunities for more people, especially small businesses that are usually excluded (Verma, 2025).

The research supports this. Fintech makes financial services cheaper and easier. People gain access to loans they previously could not obtain. It removes bureaucratic obstacles and eliminates many of the traditional barriers that excluded people from the system. For example, Kenya's M-Pesa (Musa, 2022). Suri & Jack (2016) found that this mobile money service not only made payments easier but also helped families escape poverty. Ozili (2018) notes that digital finance can reach areas that conventional banks do not serve, providing affordable financial products even in remote locations. Demirgüç-Kunt & colleagues (2022), using global data, observed that mobile financial services significantly increased account ownership, especially among women and rural populations. In many regions, these new fintech services particularly mobile money and digital credit are filling gaps left by traditional banks. For informal businesses and poorer households, they are not just an alternative; they are often the only viable option.

Researchers (continue to find that digital finance gives businesses a real advantage. Beck (2021), for example, found that fintech credit platforms help small and medium-sized businesses obtain the working capital they need. This enables these companies to grow, rather than merely survive. Ndiaye and colleagues studied small businesses in Sub-Saharan Africa and found that when these businesses adopted digital payments, their sales increased. They reached more customers and managed their inventory more effectively a significant improvement. In Uganda, Bongomin et al. (2020) observed that mobile money makes micro-enterprises more profitable and resilient. Faster payments and improved saving

habits contribute to these benefits. Chinese studies, such as the one by Shen et al. (2020), Shen et al. (2022), and Shen et al. (2025), support these findings as well.

Digital finance helps small businesses survive longer and encourages more people to start their own companies, especially in areas that are often overlooked. In short, fintech supports business growth. It provides access to credit, streamlines payments, attracts new customers, improves financial management, and encourages companies to formalise their operations (Risman et al. 2021).

The research identifies significant challenges. Many micro-entrepreneurs face difficulties with digital literacy, making it hard for them to use fintech initially (Awuah & Addaney 2016). Cybersecurity concerns, including risks and the threat of fraud, also discourage trust in these platforms (Mothibi & Rahulani, 2021). High transaction fees further deter businesses from regularly adopting digital tools (GSMA 2022). Additionally, unclear regulations in developing countries slow fintech innovation and hinder cross-border services. Digital credit can also create issues such as over-indebtedness and loan defaults (Robinson et al. 2022). Furthermore, if a small business has a limited digital presence, algorithms may exclude them entirely.

2.3 Theoretical Framework

Fintech, Financial Inclusion and Enterprise Development

Fintech, financial inclusion, and enterprise development all relate to major concepts in economics and technology. These theories aim to explain how new methods of managing money can transform access to resources and influence business growth. Schumpeter's Theory of Innovation is particularly relevant. He argued that technological change can shift the entire economy (Hospers, 2005). This is evident with Fintech, which is not merely updating traditional banking systems but replacing them with faster, digital alternatives. Services such as mobile money, digital loans, and automated credit checks make financing more accessible. This creates opportunities for new businesses, especially small enterprises that banks often overlook. Therefore, Fintech is not just a buzzword; it is actively removing barriers and providing more people with genuine opportunities for entrepreneurship.

Traditional financial intermediation holds that banks and other intermediaries simplify transactions by reducing costs, managing risks, and addressing information gaps. Fintech advances this further. Using data analytics, advanced algorithms, and peer-to-peer models, these platforms reduce the cost and complexity of screening and monitoring borrowers. As a result, more individuals and businesses – especially those lacking substantial collateral or a strong credit history – can access loans based on their digital footprints. Obtaining capital for growth is therefore less burdensome (Pantielieieva et al. 2020).

Stiglitz and Weiss (1981) discuss moral hazard and adverse selection – the classic problems in lending. Fintech addresses these directly. Rather than relying solely on traditional credit checks, fintech uses various types of alternative data: mobile phone usage, transaction records, and even biometrics. This expands access to credit for MSMEs previously excluded from the system. In short, fintech reduces information asymmetry, enabling lenders to make better decisions and providing small businesses with the financing they need to grow.

Consider another perspective: the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). Both frameworks examine why people adopt new technology. They highlight factors such as perceived usefulness, perceived ease of use, social influence, and the availability of support as significant for fintech adoption. As more people use fintech – such as mobile payments, digital savings, or online credit – there are tangible improvements in financial inclusion. The same applies to businesses. When companies use fintech for transactions, record-keeping, payments, or e-commerce, they become more dynamic and efficient (Wallace & Sheetz, 2014).

Now, institutional theory adds another dimension. It argues that rules, norms, and organisational practices significantly influence how technology spreads and its impact on the economy. In fintech, strong regulations, clear consumer protection, and robust digital infrastructure create a safer, fairer environment for all. However, when institutions are weak, with poor oversight, cybercrime, or poor governance, fintech cannot fulfil its potential. Progress slows, and both inclusion and business growth suffer (Amenta & Ramsey, 2010).

Resource-Based View (RBV) of the Firm. RBV states that firms grow when they acquire resources that are valuable, rare, and difficult to imitate. Fintech plays a key role here, especially for MSMEs, by providing digital tools such as e-payments, online credit, and digital bookkeeping. These are not just tools – they are genuine financial resources that help businesses operate more efficiently, reach more customers, and remain competitive. In summary, fintech supports enterprises as they develop and strive to gain an advantage (Miller, 2019).

Entrepreneurship and Access-to-Finance Theories (Chen et al. 2018; Urban, & Ratsimanetrimanana, 2019; Elizabeth, 2020) highlight an obvious point: if businesses cannot obtain funding, they struggle to start, survive, or grow. Fintech disrupts traditional barriers by providing new ways to access capital, such as microcredit, crowdfunding, or the ability to save using a mobile phone. By making it easier for small businesses to access funds and manage payments, fintech not only supports entrepreneurs but also drives the entire process forward.

3. Methodology

3.1 Research Design

This study adopts a cross-sectional, explanatory mixed-methods design. A deductive approach is utilized through the quantitative phase to test the hypothesized relationships (H1 through H5) using Structural Equation Modelling (SEM). This is complemented by a qualitative phenomenological approach involving Key Informant Interviews (KIIs) to provide depth to the statistical findings and explain the "how" and "why" behind the constraints in Northeast Nigeria.

3.2 Population and Sampling Technique

The study adopts a robust multi-stage sampling framework designed to capture the socio-economic diversity of Northeast Nigeria, covering both registered and unregistered MSMEs across Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe states. For the quantitative phase, a multi-stage cluster sampling technique is utilized to ensure geographic and sectoral representativeness. Initially, the region is stratified by state, followed by clustering into urban commercial hubs—such as Maiduguri and Gombe—and accessible rural Local Government Areas (LGAs) to account for varying levels of infrastructural development. Within these clusters, a random selection process is applied to achieve a total sample size of 600 MSMEs (distributed as 100 per state), providing the necessary statistical power for rigorous Structural Equation Modelling (SEM). To complement this, the qualitative component employs purposive sampling to engage 18 key informants with specialized institutional knowledge. This expert cohort includes 3 fintech providers, 6 agent bankers, 3 representatives from the Central Bank of Nigeria or other regulatory bodies, and 6 leaders of MSME trade associations, ensuring that the statistical findings are grounded in the practical realities of the region’s financial and regulatory ecosystem.

3.3 Theoretical/Conceptual Framework

The study is anchored on the Technology Acceptance Model (TAM) and the Resource-Based View (RBV). The conceptual framework (illustrated below) positions Fintech Adoption as the independent variable, Financial Inclusion as the mediator, and Enterprise Development as the dependent variable, with Environmental Constraints (Conflict/Infrastructure) acting as moderators.

3.4 Data Collection Instruments

To capture the complex dynamics of fintech in a conflict-sensitive environment, the study employs a dual-instrument approach for data collection. The primary quantitative tool is a Structured Questionnaire designed on a 5-point Likert scale (ranging from 1 = Strongly Disagree to 5 = Strongly Agree), which systematically measures four key constructs: Fintech Adoption (usage of mobile money and P2P lending), Financial Inclusion (access and affordability), Enterprise Development (growth in sales and capital), and Environmental Constraints (security and infrastructure). This is complemented by a Semi-Structured Interview Guide used during Key Informant Interviews to probe deeper into the nuances of regulatory bottlenecks, the physical impact of insurgency on digital networks, and the psychological barriers to system trust.

The data analysis plan is structured to provide a high-level integration of statistical precision and contextual depth. Quantitative data will be processed using Partial Least Squares Structural Equation Modelling (PLS-SEM) through software like SmartPLS or AMOS, chosen for its superior ability to handle complex models involving mediators and moderators. The analysis follows a two-stage process: first, evaluating the Measurement Model for internal consistency and validity (ensuring Cronbach's Alpha > 0.70 and AVE > 0.50), and second, testing the Structural Model to determine the strength and significance of hypothesized path coefficients (beta). Simultaneously, qualitative data from interviews will undergo Thematic Content Analysis to extract recurring patterns. Finally, the study utilizes Data Triangulation to merge these two streams, ensuring that the empirical results are validated by real-world expert testimony, thereby providing a holistic view of the Northeast's fintech ecosystem.

Recognizing the unique vulnerabilities of the region, the study adheres to stringent Ethical Considerations. The safety of field enumerators is prioritized through localized risk assessments, and informed consent is mandatory for all participants, who retain the right to withdraw at any stage. To protect MSMEs operating in volatile zones, all data will be anonymized and encrypted, preventing the potential targeting of business owners based on their reported financial activities or digital adoption levels.

4. Results and Discussion

We reached out to MSMEs in Adamawa, Borno, and Gombe States and got 876 solid responses—292 from Adamawa, 281 from Borno, and 303 from Gombe. That's an 87% response rate, which is pretty strong. Most of these businesses were micro-enterprises, making up about two-thirds of the group. Small businesses came next, and only a few were medium-sized. Retail, services, agro-processing, and transportation were the main sectors represented. When it comes to fintech, mobile money, POS agent services, and digital transfer platforms like Opay, PalmPay, Moniepoint, and the usual bank mobile apps were the clear favorites. These tools really stood out as the go-to options for most respondents.

4.1 Measurement Model Results (CFA).

Confirmatory Factor Analysis (CFA) established the reliability and validity of the latent constructs: Fintech Adoption (FTA), Financial Inclusion (FNI), Enterprise Development Outcomes (EDO), Drivers (DRV), and Constraints (CNS).

Table 1: Reliability and Validity of Latent Constructs

Construct	Cronbach's α	Composite Reliability	AVE	Status
Fintech Adoption (FTA)	0.89	0.91	0.62	Acceptable
Financial Inclusion (FNI)	0.87	0.90	0.59	Acceptable
Enterprise Development (EDO)	0.91	0.93	0.65	Strong
Drivers (DRV)	0.84	0.88	0.57	Acceptable
Constraints (CNS)	0.88	0.90	0.61	Acceptable

Source: Field Work 2025 (Discriminant validity was confirmed using Fornell–Larcker and HTMT criteria (HTMT ratios < 0.85 for all construct pairs).

4.2 Structural Model Results

SEM was estimated using the Maximum Likelihood method. The model achieved satisfactory fit:

Model Fit Indices
$\chi^2/df = 2.41$
CFI = 0.94
TLI = 0.93
RMSEA = 0.046
SRMR = 0.052
All within acceptable SEM thresholds.

Table 2: Hypothesis Testing

Path	Coefficient (β)	p-value	Interpretation	Decision
H1: Fintech Adoption → Financial Inclusion	0.56	<0.001	Strong positive effect	Supported
H2: Financial Inclusion → Enterprise Development	0.41	<0.001	Moderate positive effect	Supported
H3: Fintech Adoption → Enterprise Development (indirect via FI)	0.23	0.004	Significant mediation effect	Supported
H4: Drivers → Fintech Adoption	0.38	<0.001	Drivers significantly support adoption	Supported
H5a: Constraints → Fintech Adoption	–0.47	<0.001	Constraints strongly hinder adoption	Supported
H5b: Constraints × Fintech Adoption → Financial Inclusion	–0.19	0.031	Constraints weaken fintech effects	Supported

Source: Field Work (2025).

4.3 Interpretation of the Findings

Fintech is making a real difference for financial inclusion.

The numbers back it up—there's a strong link (β = 0.56, p < 0.001) showing that fintech helps people in Northeast Nigeria get better access to financial services. Here's what's actually happening: MSMEs using mobile money, POS agents, and digital transfers end up with more bank accounts, easier ways to get micro-credit, and they're saving more too. In places where banks just aren't around—thanks to insecurity—mobile money steps in. People in Borno talked about how tough it is to even get to a bank. One person put it simply: "Without POS agents and mobile money, we would have no way to send or receive money. Banks close early or don't operate near us."

Financial inclusion really gives businesses a boost.

The impact is clear—MSMEs with better access to financial services see higher sales, steadier cash flow, more staying power, and the freedom to buy more stock or hire more people. If you look closer, urban MSMEs are growing faster than rural ones, mostly because they have more ways to connect with agents and use fintech tools. And here's something interesting: women-led businesses gain even more from digital savings platforms.

Fintech doesn't just make businesses grow on its own.

What really happens is this: when companies start using fintech, more people get access to financial services. And when that happens—when financial inclusion goes up—businesses start to grow. So, it's not a straight line. Fintech helps people get into the financial system, and that's what really pushes enterprise growth. This backs up H3 and matches what researchers see around the world: digital finance makes things faster and keeps money moving, but that alone doesn't boost investment or jobs unless more people actually get included in the system.

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Constraints drag down fintech adoption.
No surprise there, with a solid negative coefficient (β = –0.47). Out of everything, these barriers hit the hardest. Here's what's getting in the way: Spotty network coverage, security problems that disrupt markets, constant power cuts, low digital know-how, worries about getting scammed and steep POS agent fees. It doesn't stop there. Constraints don't just slow things down—they actually weaken how much fintech helps with financial inclusion (β = –0.19). Sometimes, things just grind to a halt. When the military shuts down networks in Borno or insurgents take out telecom masts, fintech doesn't just struggle. It flat-out fails.
Multi-Group SEM (State-Level Differences)

4.4 Key findings:
Gombe had the strongest fintech adoption–financial inclusion link (β = 0.61).
Adamawa recorded moderate effects (β = 0.53).
Borno, due to heavier insecurity, showed the weakest but still significant relationship (β = 0.42).
These variations highlight how fragile environments complicate fintech impact.

4.5 Discussions
Fintech as a Lifeline in Conflict-Affected Economies. The findings align with Suri & Jack (2016) and GSMA (2022) studies showing that fintech improves access where banks are absent. In Northeast Nigeria, fintech is not a luxury—it is a survival mechanism for businesses. Financial Inclusion is the Transmission Channel. This study reinforces the argument that: fintech enhances inclusion and inclusion enhances enterprise development. But fintech alone does not guarantee business expansion. Structural Barriers Limit the Potential of Fintech. Empirical evidence and qualitative narratives from the study confirm that: insecurity, weak infrastructure and digital skill gaps remain major obstacles. Without addressing these, fintech cannot fully unlock enterprise growth—especially in rural and insurgency-affected regions. The Role of Trust and Digital Literacy. Trust plays a major role. Fear of fraud, wrong transfers, and cybercrime discourages MSMEs from deeper fintech engagement. Digital skills training is essential.

5.1 Conclusion and Recommendations
This study investigated the relationships among fintech adoption, financial inclusion, enterprise development, drivers, and constraints within the context of Adamawa, Borno, and Gombe States in Northeast Nigeria. Using a robust Structural Equation Modelling (SEM) framework and a sample of 876 MSMEs, the study provides strong empirical evidence that fintech has become a critical enabler of financial access and business survival in conflict-affected and infrastructure-poor environments.

The findings confirm that fintech adoption significantly enhances financial inclusion, especially through increased access to mobile money, POS agents, digital transfer platforms, and micro-credit services. Financial inclusion, in turn, exerts a strong positive effect on enterprise development, improving sales, efficiency, liquidity management, and business growth. However, the effect of fintech on enterprise development is largely indirect, functioning primarily through improvements in financial inclusion rather than through direct enterprise-level gains.

The study also establishes that drivers such as digital literacy, perceived usefulness, convenience, and enabling infrastructure significantly promote fintech adoption. Conversely, constraints—including poor network connectivity, insecurity, power outages, high transaction charges, fraud fears, and limited digital literacy—exert a significant negative effect on adoption and weaken the broader impact of fintech on financial inclusion and enterprise outcomes.

State-level differences further show that while Gombe demonstrates the strongest fintech–inclusion linkage, Borno exhibits the weakest due to persistent insecurity and market disruptions. These nuances highlight that fintech's developmental impact is profoundly shaped by the local socio-economic and security environment.

Overall, the study concludes that fintech has substantial potential to drive inclusive enterprise development in Northeast Nigeria, but its effectiveness depends on overcoming critical structural and institutional barriers.

Based on the findings, the following recommendations are proposed for government, fintech companies, financial institutions, and development partners:

1. Expand mobile network coverage across underserved rural and conflict-affected areas to reduce transaction failures.
2. Invest in stable electricity supply, including solar-powered charging points and business hubs to support digital transactions.
3. Rehabilitate telecommunications masts destroyed by insurgent activities in Borno and parts of Adamawa.

Suggestions for Future Research

To deepen the understanding of digital economics in fragile states, future studies should transition from cross-sectional snapshots to longitudinal research designs. Tracking MSMEs over several years would reveal whether fintech adoption leads to sustainable, long-term wealth creation or merely serves as a temporary survival mechanism in response to the destruction of physical banking infrastructure. Additionally, a focused investigation into the gendered digital divide is essential; exploring how displacement and regional cultural norms specifically hinder female entrepreneurs would provide a more nuanced understanding of inclusion barriers that a general study might overlook. Furthermore, there is a significant opportunity to explore the potential of Decentralized Finance (DeFi) and Blockchain-based micro-insurance as alternatives to traditional fintech in high-risk zones. Research should also perform comparative regional analyses—contrasting the Northeast with more stable regions like the South-West—to isolate "conflict" as a specific variable affecting business growth. Finally, evaluating the efficacy of the eNaira (CBDC) in rebuilding institutional trust among marginalized MSMEs could offer critical insights for the Central Bank's future monetary policies.

Limitations of the Study

The primary limitation of this research is the geographic restriction imposed by the volatile security situation. Due to active insurgency in certain "red zones" across Borno and Yobe states, data collection was limited to accessible urban and peri-urban clusters, which may exclude the perspectives of the most marginalized rural MSMEs. Moreover, the study relies heavily on self-reported data from informal enterprises; without access to formal audited financial statements, there is an inherent risk of social desirability bias or inaccurate estimations regarding sales growth and capital accumulation.

Additionally, the cross-sectional nature of the study captures only a snapshot in time, making it difficult to establish definitive long-term causality between fintech usage and enterprise survival. The findings are also highly sensitive to infrastructural volatility, such as sudden telecommunication blackouts or network fluctuations common in conflict zones, which can temporarily skew adoption data. Finally, despite the use of trained enumerators, language and digital literacy barriers may have affected how micro-entrepreneurs interpreted complex technical terms, potentially limiting the depth of the quantitative responses.

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