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Digital Finance, Financial Inclusion, and Economic Growth in Emerging Economies: Insights from Nigeria

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ABSTRACT: The quick development of fintech has transformed financial services across the world, and its impacts on financial inclusion and economic growth are observable everywhere on the planet, developing countries such as Nigeria not being exceptions. This paper investigates the impact of fintech adoption on Nigeria's economic growth for the period 1999–2022 with a concentration on the key proxies: automated teller machine, point-of-sale transactions, financial deepening, exchange rate, and inflation. Employing the Autoregressive Distributed Lag (ARDL) model, we examine both the short- and long-run time path to account for dynamics among financial innovation and macroeconomic performance. The findings indicate that fintech measures, specifically POS transactions and ATM transactions have a significant and positive impact on the GDP growth of Nigeria while financial deepening also fortified long-term equilibrium. That said, inflation and exchange rate volatility are still dampening some effects of fintech growth at times. Regulatory frameworks that support price and exchange rate stability are crucial to enhancing the digital financial ecosystem in Nigeria. This study underscores the role of fintech in driving inclusive and sustainable growth and yields policy insights that are useful to regulators, banks, or investors who may wish to maximize digital transmission of finance for a nation's development

Keywords: Fintech; Financial inclusion; Economic growth; Nigeria; Digital payments; Financial deepening; ARDL model

I.   INTRODUCTION

Internationally, financial technology (fintech) has been described as having transformational effect over financial systems through lowering cost of transactions as well as increasing access to financial services and driving of economic development (Del Sarto & Ozili, 2025). This transformation is well observed in developing countries where technologies such as digital payment service, mobile money, and other fintech tools offer the possibility to increase productivity, foster efficiency, and stimulate an inclusive development (Ha, 2025).

In Africa, fintech has become a key driver of financial inclusion and economic inclusion especially in mobile banking, and digital finance services that cater to previously unbanked groups (Mashoene, 2025). Sub-Saharan Africa, which is known for low financial access, has, in the past years, registered significant developments in financial inclusion and economic integration following the rapid uptake of fintech across urban and rural areas (Hornuf, 2025).

Nigeria, with its largest fintech ecosystem in Africa, is at the epicenter of this shift. The country harbours about 30% of all fintech firms on the continent which attests to domestic innovative capacity and the ability to attract foreign investment (CBN, 2024). Efforts such as the AfriGo Pay launched in January 2023 by the Central Bank of Nigeria (CBN) are intended to foster financial inclsuion and strengthen Nigeria's movement along the cashless economy (CBN, 2023). So is the October 2021 launch of the eNaira, Africa's first digital currency from the central bank (CBDC), an innovation whose embracing is constrained, thank you to an infrastructure of constraint and of trust (Okoye & Umeji, 2024).

Private sector efforts also help illustrate Nigeria's fintech dynamism. For example, Paystack — purchased in 2020 by Stripe for over US$200 million — carries out a significant number of online

transactions, indicative of the burgeoning influence of this sector on local and global financial markets (Ejemeyovwi et al., 2023). However, the relationship between fintech adoption, financial inclusion, and the overall economic growth of Nigeria has not been adequately comprehended. Indeed, the number of empirical research papers that develop models of growth incorporating proxies of financial technology such as ATM usages, POS transactions, and financial deepening is small, and to this effect, this study aims to bridge this important knowledge gap.

STATEMENT OF THE PROBLEM

However, in Nigeria, which has (since 2014) become the biggest fintech ecosystem in Africa, much leaves to be studied about the interplay between fintech adoption, financial inclusion, and economic growth. Although fintech solutions like POS payments, mobile-banking, digital lending have widely increased the access to finance, their macroeconomic impact has been questionable. For example, the eNaira and AfriGo pay are bold policy attempts, whose adoption rates are low due to infrastructure deficits, regulatory hurdles and skepticism among users (Okoye & Umeji, 2024). Equally, fintech companies such as Paystack and Flutterwave have garnered global attention but are yet to be thoroughly assessed for their domestic impact on developmental inclusiveness and long-term growth.

The available empirical evidence on fintech and economic growth in Nigeria is still disjointed. On the one hand, some studies suggest a positive association between digital finance and GDP growth, and on the other hand they depict weak and insignificant effects, especially when taking into consideration structure measures as inflation and exchange rate volatility (Del Sarto & Ozili, 2025; Idris, 2025). In addition, there has been little focus on incorporating fintech-related indicators – for example, ATM transactions, POS transactions, and financial deepening –into dynamic econometric models that can distinguish between short- and long-run effects.

This dearth of rigorous empirical modeling leaves a major deficit for researchers as well as for policymakers. There is need to understand the contribution of fintech to Nigeria digital economy for the purpose digital finance policies, regulatory frameworks and investment strategies. In the absence of such evidence, policymakers may be prone to overestimating or underappreciating fintech's potential to spur development that is inclusive and sustainable. To fill this gap, this study undertakes a rigorous econometric analysis of how fintech and financial inclusion fuel Nigeria's economic growth that is based on rigorous econometric analysis while being academically rigorous and policy relevant.

RESEARCH OBJECTIVES

The research questions of the study were to:
1. What is the effect of ATM usage on Nigeria's economic growth?
2. To what extent do POS transactions contribute to Nigeria's economic growth?
3. How does financial deepening influence economic growth in Nigeria?
4. In what ways do inflation and exchange rate conditions shape the relationship between fintech adoption and economic growth in Nigeria?

RESEARCH QUESTIONS

The research objectives were:
1. Assess the impact of ATM usage on Nigeria's economic growth.
2. Evaluate the contribution of Point-of-Sale (POS) transactions to economic growth in Nigeria.
3. Investigate the role of financial deepening in enhancing economic growth in Nigeria.
4. Analyze how macroeconomic factors such as inflation and exchange rate moderate the relationship between fintech adoption and economic growth in Nigeria.

RESAERCH HYPOTHESIS

To provide empirical answers to these questions, the study tests the following null hypotheses (H_0):

H_{01}: ATM usage does not have a significant effect on Nigeria's economic growth.

H_{02}: POS transactions do not significantly contribute to Nigeria's economic growth.

H_{03}: Financial deepening does not have a significant impact on Nigeria's economic growth.

H_{04}: Inflation and exchange rate conditions do not significantly moderate the relationship between fintech adoption and economic growth in Nigeria.

SCOPE OF THE STUDY

There are four dimensions that delimit the strategy of this research: geographical, temporal, variable, and methodological. Geographically, the research scope is limited to Nigeria, which partly mirrors the country-specific fintech landscape and economic context, and also as the gateway to Africa's single largest market for digital finance. In time, the study is between 2010 to 2023, as it depends on data available from the major sources such as (CBN, NBS, and the World Bank).

In variables, use of fintech is proxied by ATM use and POS transactions, and financial development is measured by such variables as the credit-to-GDP ratio. Macroeconomics such as inflation and exchange rate is included as control for external shocks where sequence amount of GDP is the dependent variable as

economic growth. Methodologically, ARDL Model has been adopted in the current study to model both short-run and long-run relationships, thus facilitating a better understanding of contribution of fintech adoption and financial inclusion on growth of Nigeria (Idris, 2025).

SIGNIFICANCE OF THE STUDY

Both in terms of academic research and policy implications, this study has important implications. From a conceptual point of view, the paper adopts into an economic growth model a number of fintech-related variables, such as ATM transactions, POS transactions and financial deepening, which represents a significant omission from the literature. Using the Autoregressive Distributed Lag (ARDL) approach, the study generates an overwhelming evidence base on the fintech–growth connection in Nigeria, which would corroborate recent global evidence (Idris, 2025).

Policy Implications The policy implication of the study is significant for the Nigerian financial regulators and operators of Fintech, Notably CBN on the most efficient fintech channels that can be employed to promote economic growth. These insights may also guide regulatory reforms, investments in digital infrastructure and targeted efforts for financial inclusion—particularly as ongoing intervention attempts such as the eNaira and AfriGo Pay are continued. The practical implications of this for fintech firms and incumbent banks are no less profound: The new findings will make it clearer which tech-driven services contribute most to economic inclusion, and so will help to shape corporate strategies for investment, product development and operational focus in the space of inclusive growth.

II.   LITERATURE REVIEW

CONCEPTUAL REVIEWS

Financial Technology (Fintech)

Fintech is the use of technology and big data in order to design and deliver new and innovative financial services. It uses finance, technology and innovation to stimulate efficiency, accessibility and inclusiveness in the financial systems (Lee et al., 2021). Fintech consists of many forms: mobile payments, digital lending, blockchain solutions, robo-advisory, peer-to-peer platforms, insurtech, and more, all with the potential to transform general banking activities, as they all specialize in providing faster, customer-focused services (Zavolokina et al., 2020). Fintech companies are increasingly described as disruptive entities that use digital platforms, big data analysis and automation to transform service provision and market structure (Gomber et al., 2022).

However, policy makers and regulators recognise the transformative role fintech has played in promoting financial inclusion, creating transparency, and broadening access to the previously excluded. In developing economies, fintech is fostering growth through the reduction of transaction costs, the development of access to credit, and the expansion of innovative financial intermediation (Ozili, 2023).
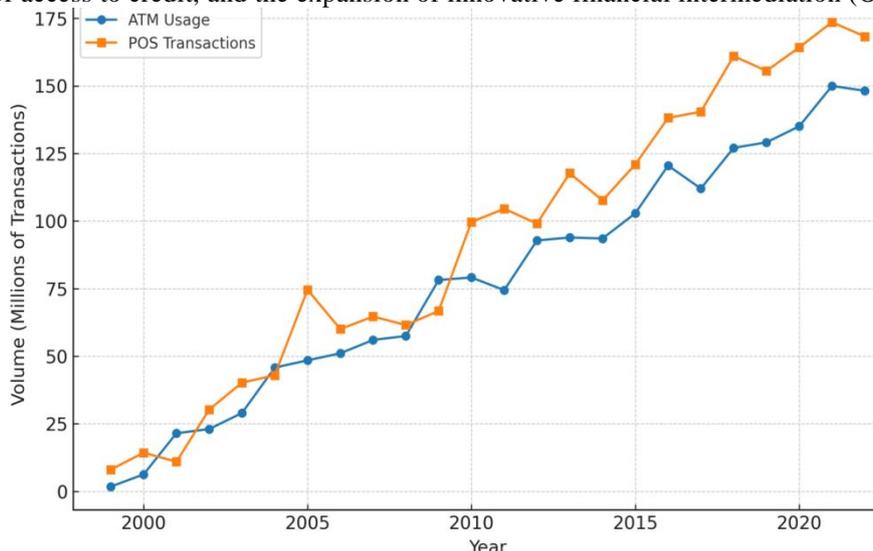
Figure 1: Trends in Fintech Adoption in Nigeria (1999–2022)

This figure illustrates the growth trajectory of fintech adoption in Nigeria, measured by Automated Teller Machine (ATM) usage and Point-of-Sale (POS) transactions from 1999 to 2022. The upward trend highlights Nigeria's increasing reliance on digital financial services, reflecting broader efforts to enhance financial inclusion. The data suggest fintech's expanding role in reshaping payment systems and contributing to economic growth.

Financial Inclusion

Financial inclusion is characterized as the ease of access to and use of responsible, affordable financial services (including savings, credit, and insurance and payments) for all individuals and businesses, especially the poor and the marginalized segments (Demirgüç-Kunt et al., 2022). It's not just about access but use and quality, such that financial services are pertinent, safe, and sustainable" (Allen et al., 2020).

Academic discourses underscore that financial inclusion leads to poverty alleviation, resilience development, and productive investment facilitating inclusive growth (Aduda & Kalunda, 2022). Recent policy agendas in most of the developing economies, inclusive Nigeria, have positioned inclusiveness at the center of sustainability concern especially with regards to women, youth and the rural households (World Bank, 2023). Accordingly, inclusion should be measured not simply in terms of ownership but also in terms of how extensively people effectively use services, such as digital payments, the ratio of credit to GDP, and the adoption of mobile money.

Economic Growth

Economic growth is the long-term expansion of a nation's productive potential as measured by the increase in its real gross domestic product or real GDP. Growth may stem from extensive factors, such as allocating more of labor and capital inputs, or from intensive factors such as better labor and technology (Barro, 2020). In modern literature, growth is also associated with digitalization: technology facilitates efficiency, enlarges the set of available production opportunities and enhances market integration (Acemoglu & Restrepo, 2021).

Growth is what increases the amount of output, but it is also development that increases the quality of life and welfare (Rodrik, 2022). In low-income and developing countries, financial innovations – digital finance in particular – are critical drivers of growth through their impact on consumption, investment, and productivity (Sahay et al., 2020).
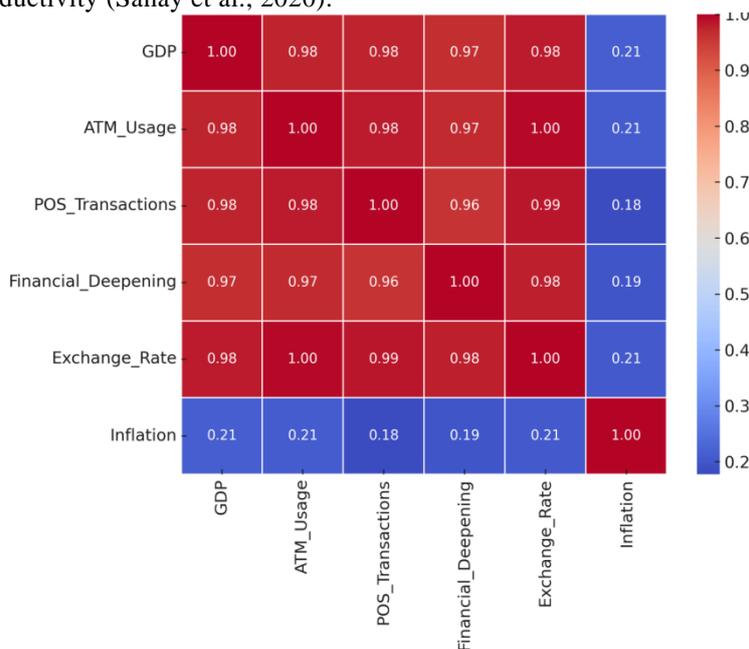
Figure 2: Correlation Heatmap of Key Variables

This heatmap depicts the correlation relationships between key variables, including GDP, ATM usage, POS transactions, financial deepening, exchange rate, and inflation. Strong positive correlations between fintech indicators (ATM and POS) and GDP emphasize fintech's role in stimulating growth, while exchange rate and inflation show weaker or negative associations. The visualization provides an intuitive understanding of variable interdependencies before regression analysis.

Integration into the Study Context

Fintech, financial inclusion and economic growth in Nigeria: A Case for the neoliberal framework for analyzing the interaction of all three. Fintech Implications—the use of ATMs, POS transactions and financial deepening—other channels through which accessibility and applicability to financial services strengthen. Such instruments allow for greater participation in the formal financial system and promote financial inclusion. This inclusion will create productive investment, risk management and consumption that will result in an increase in GDP.

Through a clear delineation and positioning of these ideas in the current academic debate, this research forms a solid conceptual basis for the subsequent empirical investigation. This alignment confirms that the theoretical and econometrical models capture the global relevantisation and the Nigerian practicalisation of the fintech-driven inclusion and growth.

THEORETICAL REVIEW

In elucidating the channels of fintech on promoting economic growth, especially the role played by ATM usage, POS transactions and financial deepening on economic performance, this study is buttressed by a strong tripartite theoretical background. This framework combines Schumpeter's Innovation Theory, Endogenous Growth Theory, and the Technology Diffusion Model to offer intersecting insights with respect to how fintech innovations influence macroeconomic outcomes.

Innovation Theory (originally coined Schumpeter, 1911; cited in Pol & Carroll, 2006) is based on the notion that technolo-gical advancement resulting from entrepreneurial in-vention is what drives the economy; a process through which old ways of doing things are destroyed and re-placement with more economically efficient methods. In the fintech industry, products like digital payment platforms, mobile and online banking, e-channels, and others challenge traditional banking systems, improve performance, and increase access to financial products. These disruptions open up new markets, lower transaction frictions and produce transformative changes that set off economic development.

Continuing along these lines, Endogenous Growth Theory (Romer, 1986; Aghion & Howitt, 1992), for example, shows how growth is determined endogenously with investments being made in human capital, knowledge and innovation. It is through these spillover effects — including higher productivity, lower financial intermediation costs, and enhanced credit access — that fintech acts as more than a collection of electronic gadgets that together contribute to long-run growth. Through enhanced financial inclusion and widened access to credit, fintech reinforces the productive base of the economy and growth becomes more durable.

Both have been complemented by the Technology Diffusion Model (Rogers, 1962), where the spread of innovations in culture, through societies, was emphasized, from innovators, to early adopters and finally societies at large. The model underlines that innovation generates economic impact only when its adoption becomes widespread. In the fintech space, evidence of this diffusion is seen in the explosion of POS networks and ATM penetration as well as mobile payment platforms in Nigeria. Speed and breadth of adoption are affected by perceived benefits, ease and policy support, which in turn determine the depth of fintech's macro-economic implications.

Recent empirical findings indicate the applicability of these theories. For example, fintech innovations boost economic growth, especially in developing countries, as Cevik (2024) supports, reflecting the Schumpeter □s disruption idea. Similarly, Idris (2025) argues that the impact of fintech on growth may be best analysed through a mixed framework combining Schumpeterian dynamics and Rogers' diffusion lens. Taken together, these studies confirm that fintech, when not a bubble phenomenon, is both an impetus to innovation and a lever of wide-based growth when its adoption becomes widespread. These three theoretical threads fit together into a coherent analytic substrate. Schumpeter's theory provides the reasons banks are shaken up (the destablization by fintech); Endogenous growth Model shows the ways fintech translates to continued returns through productivity and knowledge spillovers; and the Diffusion Model explains how fintech scales for their innovations to have a economy broad impact. Accordingly, in this work, a hybrid theoretical framework is proposed based mainly on Schumpeter's Innovation Theory and Endogenous Growth Theory, complemented with the Technology Diffusion Model as a process framework. This dual approach offers a holistic perspective on the birth, growth and impact of fintech on Nigeria's economic development trajectory.

EMPIRICAL REVIEW

In the past five years, the evidence has grown from the proxies to the actual fintech transactions, bringing consensus that digital finance can contribute to economy when carefully spread and regulated. Utilizing a data set of 198 countries from 2012 to 2020, Cevik (2024) channels digital credit and online capital collection as determinants of real GDP per capita growth alongside traditional inputs and finds that digital lending exerts a statistically significant growth-improving effect, while digital capital-raising sends weaker signals; yet, the fintech indices are all growth-enhancing. particularly in the developing countries. Aguilar, Frost, Guerra, Kamin, and Tombini (2024), who study 101 economies in the 2014–19 period, also find that there is a productivity and an inclusion channel, showing that a one-percentage-point surge in take-up of digital payments boosts GDP per capita growth rate over two years by 0.10 percentage point and reduces labor informality. These results are reinforced by further studies: Ahmad et al. (2023) emphasize the complementarities of mobile money, ICT, and financial inclusion in an augmented Solow model; Xi et al. (2023) argue that digital financial inclusion stimulates entrepreneurial-based growth; Osabutey et al.

(2024) analyze welfare gains from mobile money in Africa; and Koranteng et al. fintech growth can raise financial stability concerns, emphasizing the potential for non-linearities?

Regional evidence emphasizes institutional conditioning. Chinoda et al. (2024) find that the quality of governance has a moderating role in the connection between digital inclusion and growth across Sub-Saharan Africa (SSA) and Meniago (2025) comes to similar findings for SADC economies. Pal et al. (2025) also report heterogeneity across emerging economies, showing greater effects in countries that have strong human capital and digital infrastructure. Suri (2023), examining SSA evidence, notes that as of 2021 mobile money had reached 33% of adults with casual connections to resilience and market engagement. Grzybowski et al. (2023) use microdata to establish that mobile money enhances inclusion and market outcomes, whereas Osuma et al. (2025) report that financial penetration ameliorates poverty and accelerates growth in all SSA areas. Hasan et al. (2024) find mobile money and agent networks to be the most expanding inclusion factors. Furthermore, knowledge-basket ARDL of East African economy and panel causality (Ngong et al., 2024) show a long run cointegration relationship between fintech indicators and growth, with short run dynamics representing adoption dynamics. Altogether, these studies corroborate that quality of institutions, state capacity, and complementary infrastructure are fundamental in determining the developmental dividend of fintech.

Aggregately, Nigeria-specific literature, which is squarely in consonance with the variables of this study (POS, ATM, financial deepening and macroeconomic stability) overwhelmingly uphold the fintech-growth nexus but with context-specific differentiations. ARDL and time-series models with CBN and NIBSS data also show evidences that POS and ATM transactions have significant impacts on real GDP and at times has more significant impacts; (Ekpo, 2025; Adeniji, 2025; Nwadiubu, 2023; Iwedi et al., 2024). Sectorals studies have also found presence of bank specific effect, on the relationship between e-payment and bank earnings thus giving credence to effeciency intermediation effect (Ibrahim, 2024 and Zaccheaus, 2023); global studies realted digital transaction to cashless effeciency of the market and formalization of the market (Adedotun et al., 2023; CBN, 2021). Furthermore, the evidence from Nigeria shows that currency in circulation as well as rapid POS spreading are two important productivity spillovers. However, as results are not always positive : Lamba (2025) finds that the coefficient of inclusion composite indices in his ARDL is negative, the authors reports that this is due to the misallocation of credit; this echoes some concerns observed in the "too much finance" literature (e.g., Akintola et al., 2020). Research also highlights that exchange-rate fluctuations and inflation could well constrain fintech-induced benefits, which could decrease real balances and induce delays in diffusion (RSIS, 2025). The significance of diffusion and infrastructure reliability is pointed out repeatedly, since growth effects are reinforced as agent density, network stability, and literacy increase (BIS, 2019; VoxDev, 2019).

On balance, the empirical literature coalesces around the idea that fintech spending and digital financial inclusion drive growth, but with impacts that hinge upon institutional capacity, macroeconomic stability, and infrastructure penetration. To Nigeria, the stable and positive impact of POS and ATM on financial deepening is dampened by inflation and exchange-rate pressures proving imperative the incorporation of governance, infrastructure and diffusion elements. These results are consistent with Schumpeter's Innovation Theory (innovation Fshocks through digital finance), Endogenous Growth Theory (technology and financial Fintermediation as drivers of economic growth), and the Technology Diffusion Model (scale and network effects) parties in this process. Thus, in light of this and as has been done in this study, I am leaning on a hybrid framework around Schumpeter as well as the theory of Endogenous Growth in which diffusion processes have remained the mechanism through which fintech proxies are linked to their respective economic growth outcome in the Nigeria context.

GAP IN LITERATURE

Despite the vast literature on Fintech as well as on the links between financial inclusion and financial technology and growth, few gaps deserve mention. At the global level, while empirical research confirms a positive role for digital payments, mobile money and fintech innovations in growth (Cevik, 2024; Aguilar et al., 2024), there are few instances of this evidence being presented in country-specific context which could obscure country-level dynamics. For example, the institutional quality, policy regimes, and infrastructure constraints typical of emerging economies such as Nigeria are rarely properly reflected in regional or global studies. This limits the transferability of their findings to policy implications at the national level.

In Africa, studies have, to a great extent, focused on the adoption of mobile money and its role to achieve financial inclusion, specially that East Africa in which M-Pesa and its counterparts is dominant (Ngong et al., 2024; Suri, 2023). Yet there have been fewer studies to empirically investigate the Nigerian landscape, where fintech growth is more fragmented and includes ATMs, POS transactions, domestic card schemes like AfriGo, and CBDCs like the eNaira. Previous research in Sub-Saharan Africa tends to
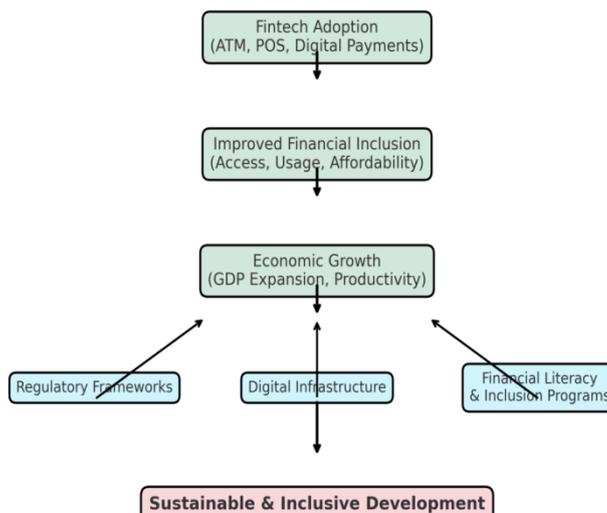
combine countries into regional panels, but in doing so overlooks the distinctive combination of Nigeria's enablers of digital payment (digital payment infrastructure, large population, regulatory idiosyncrasies).

At the National level, the empirical literature is fragmented and inconclusive when it comes to Nigerians. For instance, some authors demonstrate that ATM use, POS transactions and electronic payments drive growth (Ekpo, 2025; Adeniji, 2025; Iweh et al., 2024), compared to others that have found weak and even negative growth effects, especially when macroeconomic instability is taken into account (Lamba, 2025). Second, many other studies tend to consider only a particular proxy of fintech ─ such as mobile banking or POS transactions ─ in isolation, rather than employing an overall fintech framework by integrating some fintech proxies and major macroeconomic variables, such as exchange rate and inflation. This narrow definition overlooks the intricate relationship between financial deepening, digital uptake and growth.

A third area of incompleteness is the methodological perspective. Some Nigerian studies use descriptive statistics and simple correlation and can therefore not make strong inferences. Even when econometirc methods like OLS or simple regression are employed short-run and long-run dynamics are seldom discussed. Even though more advanced time series methods like the ARDL-model, which incorporates both shortrun adjustments and long-run equilibrium relationships are currently not as widely used in this field.

In addition, the lack of a consistent and organized theoretical frame that links innovation, growth processes and diffusion dynamics is noted in the few studies that have explicitly motivated their work. Though Innovation Theory by Schumpeter, Endogenous Growth Theory and the Technology Diffusion Model are existing theories, the combined use of them to fintech adoption and growth in Nigeria is sparse. This weakens the explanatory power of previous studies and opens up a space for a theoretical inquiry.

In light of this context, this paper provides three key contributions. First, it combines several fintech indices, including ATM usage, POS transactions, and financial deepening, in a single model with macroeconomic controls to offer a full view of fintech influence on Nigeria's economic growth. Second, by utilizing the ARDL approach, it allows a more sophisticated investigation of short-run and long-run relationships, which is a more robust approach compared to previous Nigerian studies. Third, it grounds the analysis in a strong theoretical framework that choices from Schumpeter's Innovation Theory, Endogenous Growth Theory as well as the Technology Diffusion Model which may deliver even more light to how innovation, knowledge accumulation and adoption dynamics connect to growth. Between them, these chapters ensure that the work fulfils its dual role of not only filling empirical and methodological lacunae in the Nigerian literature, but also contributing to the wider debate on fintech- led growth in developing economies.

CONCEPTUAL FRAMEWORK

Figure 3: Conceptual Framework of the Effect of Fintech and Financial Inclusion on Economic Growth in Nigeria

This framework illustrates how fintech adoption (ATM usage, POS transactions, and financial deepening) influences economic growth, with financial inclusion serving as the mediating pathway. Macroeconomic and institutional factors—exchange rate, inflation, and regulatory quality—moderate the strength of this relationship. The framework emphasizes that inclusive and well-regulated fintech diffusion enhances financial access, which in turn stimulates sustained economic growth.

Figure :4 Policy Implication Framework of Fintech, Financial Inclusion, and Economic Growth

This framework demonstrates how fintech adoption (ATM, POS, digital payments) fosters financial inclusion, which drives economic growth in Nigeria. Policy levers such as regulatory frameworks, digital infrastructure investment, and financial literacy programs reinforce this pathway. The final outcome is sustainable and inclusive development, highlighting the importance of coordinated policy actions to maximize fintech's transformative role in the Nigerian economy.

III.   METHODOLOGY

RESEARCH DESIGN

TheThis research employs a historical perspective which is suitable for testing the effect of fintech on economic growth in Nigeria. Because the variables of interest: GDP, ATM use, POS transactions, financial deepening, the exchange rate, and inflation—could not be created and controlled, the ex-post facto methodology offers a sound basis for establishing causation. In addition, the design permits applying econometric modelling to examine short run and long run interactions, in accordance with recent empirical work on financial inclusion and growth.

DATA SOURCES AND STUDY AREA

TheWe utilize secondary time-series observations for the year spanning 2010 through 2023 (or as obtainable) which correspond to the pace of fintech evolution and financial inclusion reform in Nigeria. Data come only from reliable organizations for minimum errors:

Central Bank of Nigeria (CBN) Statistical Bulletin (various editions) for data on ATM usage, POS transactions, financial deepening, inflation, and exchange rate.

National Bureau of Statistics (NBS) for macroeconomic aggregates.

World Development Indicators (WDI) and International Monetary Fund (IMF) databases for supplementary macroeconomic indicators and cross-validation.

The temporal scope captures critical policy interventions such as the CBN's cashless policy (2012), the launch of the eNaira (2021), and expansion of digital payment infrastructure (AfriGo scheme in 2023).

MODEL SPECIFICATION

The study's model is anchored on Schumpeter's Innovation Theory, Endogenous Growth Theory, and the Technology Diffusion Model, which collectively explain how fintech adoption spurs productivity through financial intermediation and widespread adoption.

These variables are expected to influence economic growth both directly and indirectly, especially in an increasingly digitized and interconnected financial ecosystem. Thus, with the inclusion of these control variables, the functional relationship among the variables in this study is specified as follows:

$$GDP_t = f(ATM_t, POS_t, FTH_t, FTH\_FI_t, FII_t, FDP_t, INF_t, REX_t)$$ …………………..(3.2)

$$FII_t = NCB_t + CPS_t + BDA_t$$ …………………………………… (3.3)

Using the normalization and averaging approach based on the UNDP Human Development Index (HDI) style method:

$$N_{CPS} = \frac{CPS - Min(CPS)}{Min(CPS) - Max(CPS)}$$

$$N_{NCB} = \frac{NCB - Min(NCB)}{Min(NCB) - Max(NCB)}$$

$$N_{BDA} = \frac{BDA - Min(BDA)}{Min(BDA) - Max(BDA)}$$

$$FII = \frac{N_{CPS} + N_{NCB} + N_{BDA}}{3}$$

$$N_{ATM} = \frac{ATM - Min(ATM)}{Min(ATM) - Max(ATM)}$$

$$N_{POS} = \frac{POS - Min(POS)}{Min(POS) - Max(POS)}$$

$$FTH = \frac{N_{ATM} + N_{POS}}{2}$$

Generally, the model is empirically transformed into the following econometric form:

$$LGDP_t = \beta_0 + \beta_1 ATM_t + \beta_2 POS_t + \beta_3 FTH_t, \beta_4 FII_t + \beta_5 FTH\_FI_t + \beta_6 FDP_t + \beta_7 INF_t + \beta_8 REX_t + \varepsilon_t$$
(3.4)

Where:
GDP = Economic growth (proxied by GDP)
FTH=Financial Technology Index
FII=Financial inclusion index
FTH)FI= Moderated variable of FTH and FII
ATM = ATM Usage
POS = Point-of-Sale Transactions
NCB = Number of Bank Branches (availability)
CPS= Credit to the Private Sector (% of GDP) (usage)
BDA = Bank Depositors per 1,000 adults (penetration)
FDP= financial deepening
REX= Exchange Rate
INF = Inflation Rate

This functional form lays the foundation for the econometric modeling and estimation of the relationships among financial technology, financial inclusion, and economic growth in Nigeria. Furthermore, four empirical models were adopted based on the conceptualization from a similar study by Idris and Dzugwahi (2025), Ayodele and Egbogu (2024), Chukwu et al. (2024), and Samuel (2023) This model addressed the studies objectives as follows:

This model addressed the study objective one which is to examine the effects of financial technology on economic growth in Nigeria. Therefore, the model is stated thus:

$$GDP_t = f(ATM_t, POS_t, FDP_t, INF_t, REX_t) \quad ....(3.5)$$

$$LGDP_t = \alpha_0 + \alpha_1 ATM_t + \alpha_2 POS_t + \alpha_3 FDP_t + \alpha_4 INF_t + \alpha_5 REX_t + \varepsilon_t \quad ....(3.6)$$

Where;
GDP = Economic growth (proxied by GDP)
ATM = ATM Usage
POS = Point-of-Sale Transactions
FDP= financial deepening
REX = Exchange Rate
INF = Inflation Rate

a0 = represent constant, a_1-a_6 are the coefficients, t represent time and ε_t is the error term. A Priori expectations in line with extant literature are: a1 > 0, a2> 0, a3 > 0, a4> 0, a5 > 0, a6 > 0. It is expected that, ATM usage a1, Point-of-Sale Transactions a2, financial deepening, inflation rate, and exchange rate, will be positively or negatively related to economic growth within the period of study

VARIABLE DESCRIPTION AND MEASUREMENT

Variable Type	Variable	Proxy/Measurement	Expected Sign
Dependent	Economic Growth (GDP)	Real GDP growth rate	—
Independent	ATM Usage (ATM)	Value/volume of ATM transactions (₦ billions)	+
Independent	POS Transactions (POS)	Value/volume of POS transactions (₦ billions)	+
Independent	Financial Deepening (FDP)	Broad money (M2)/GDP or domestic credit/GDP ratio	+
Moderating	Exchange Rate (REX)	Annual average ₦/US$	±
Moderating	Inflation (INF)	Annual CPI inflation rate (%)	±

A PRIORI EXPECTATIONS

Consistent with existing literature, the coefficients of the fintech proxies are anticipated to have a positive impact on economic growth. In particular, ATM and POS transactions are expected to contribute to GDP through financial inclusion promotion and gains in transaction efficiency. Similarly, financial deepening is expected to support intermediation and investment, thus enhance long-run growth.

The exchange rate can have a positive or negative effect depending on general macroeconomic circumstances: a stable exchange rate can promote investment and productivity; whereas an excessive volatile rate can erode investor confidence and constrain future growth potential. In the same way, inflation can be a "double-edged sword" that on moderate terms can spur growth, while — at high levels — it could be a tax on purchasing power and a drag on sustainable growth.

ESTIMATION TECHNIQUE

In view of the nature of the data, the ARDL modelling is used in this research. ARDL is especially well-suited because it permits the inclusion of I (1) and property I(0) variables, which forestalls the possibility of pre-testing for unit roots bias. Most importantly, it allows for the estimation of the pro-cyclicality of short and long-run relationships between fintech indicators and growth. Furthermore, due to the ECM, it is ensured that the model is able to reflect the speed of the equilibrium adjustment with a lagged short-term deviation.

The empirical approach is structured in several steps. The series is first tested for stationarity by Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) test. Second, the best lag length is selected based on AIC, to have an efficient model specification. Third, the ARDL bounds test is used for the cointegration between the variables. Fourth, the ECM specification is pooled to adjust for short-term dynamics while modelling the adjustment to long-run equilibrium. Lastly, a battery of diagnosis tests such as the test for serial correlation, heteroscedastic, normality and global model specification tests are used to verify the robustness and reliability of the results.

JUSTIFICATION OF METHODOLOGY

This approach adds up robustness by combining fintech's proxies (ATM, POS, FDP) with macroeconomic controls (REX, INF). The ARDL approach has the advantage of being able to capture the dynamic relationship between the variables and is therefore for Nigeria a mixed order of integration and a relatively short time–series data used. By anchoring empirical analysis in theory as well as rigorous techniques of econometrics, it yields powerful results on the relationship between fintech and growth.

IV. DATA PRESENTATION AND DISCUSSION OF RESULTS

INTRODUCTION

This chapter reports empirical findings of the analysis of the impact of Fintech on economic growth in Nigeria. Subsequently, the argument is made by going to stepwise: (1) descriptive statistics and correlation analysis, (2) the unit root test and the selection of the lag length, (3) bounds cointegration test, and (4) ARDL

estimations, and (5) robustness diagnostics. Every subsection is explained according to the theoretical assumptions and associated with pertinent policy implications.

DESCRIPTIVE ANALYSIS

Table 4.1 Descriptive statistics of ATMs Transactions (ATM), POS Transactions (POS), Financial deepening (FDP), HRPB (HRPB), Inflation rate (INF) and Real Exchange Rate (REX). The findings display significant properties of the distributions of the series.

ATM transaction values average ₦9,938.20, with substantial variability (Std. Dev. ₦10,581.73) and a positively skewed distribution. POS transactions have a much higher dispersion (Std. Dev. ₦30,305.00) and are highly skewed and leptokurtic, suggesting sharp growth in digital payments adoption during the period.In contrast to, FDP exhibits relative stability (Mean = 22.96%, Std. Dev. = 1.86%). Average inflation (13.70%) was resistant (with moderate variability) and exchange rate (Mean = ₦114.64) was relatively stable when contrasted with the fintech variables.

In general, the distributions of most of the variables are near-normal, with the exception POS, which is severely skewed and kurtotic, contradicting the rapid growth in retail digital transactions due to CBN's cashless policy. This descriptive evidence highlights the growing importance of fintech to the Nigerian economy.

Table 4.1:Summary Table for Financial Technology and Economic Growth

	ATM	POS	FDP	INF	REX
Mean	9938.20	13523.96	22.96	13.70	114.64
Median	5712.86	1084.41	23.11	12.74	116.33
Maximum	32648.02	110347.10	27.09	24.66	133.19
Minimum	399.71	12.72	19.82	8.05	100.00
Std. Dev.	10581.73	30305.00	1.86	4.55	9.80
Skewness	1.13	2.61	0.22	0.89	0.01
Kurtosis	2.79	8.72	3.36	3.43	2.30
Jarque-Bera	3.01	34.90	0.19	1.98	0.28
Probability	0.22	0.00	0.91	0.37	0.87
Observations	14	14	14	14	14

Source: Author's computation from Central Bank of Nigeria and World Bank data (2025)

4.3 Correlation Analysis

The correlation matrix (Table 4.2) shows that GDP is strongly and positively correlated with ATM (0.762), POS (0.591), and FDP (0.639). Inflation (0.529) and exchange rate (0.652) also demonstrate positive associations with GDP. Importantly, fintech indicators (ATM and POS) are themselves strongly correlated (0.775), reflecting their complementary role in facilitating cashless transactions.

None of the coefficients exceed 0.80, suggesting that multicollinearity is not a major issue. The positive and significant correlations provide preliminary evidence that fintech and financial deepening are linked to Nigeria's economic performance.

Table 4.2:Correlation matrix for Financial Technology and Economic Growth

	LGDP	LATM	LPOS	FDP	INF	LREX
LGDP	1.000					
LATM	0.762	1.000				
LPOS	0.591	0.775	1.000			
FDP	0.639	0.634	0.686	1.000		
INF	0.529	0.767	0.631	0.657	1.000	
LREX	0.652	0.542	0.247	0.368	0.003	1.000

Source: Author's computation from Central Bank of Nigeria and World Bank data (2025)

4.4 Unit Root Tests

Augmented Dickey-Fuller (ADF) tests (Table 4.3) indicate a mixture of stationary variables: ATM and FDP are I(0), while GDP, POS, and inflation become stationary at first difference [I(1)]. This mix of I(0) and I(1)

variables, with none integrated at order two, justifies the use of the ARDL bounds testing approach, which is suitable for such conditions.

Table 4.3:Unit Root Tests for Financial Technology and Economic Growth

| Variables | Augmented Dickey-Fuller test statistic | | Remark |
	Level	first difference	
LGDP	-2.390 (0.365)	-2.717 (0.011)	I(1)
LATM	-4.563(0.016)		I(0)
LPOS	-1.956(0.570)	-3.886(0.0492)	I(1)
FDP	-3.762 (0.049)		I(0)
INF	-1.980(0.533)	-2.328(0.025)	I(1)
LREX	-2.408(0.158)	-3.122(0.004)	I(0)
FII	1.033(0.993)	-5.942(0.000)	I(1)

Note: P-values in parenthesis
Source: Author's computation from Central Bank of Nigeria and World Bank data (2025)

4.5 Lag Length Selection
The VAR-based lag selection criteria (Table 4.4) unanimously indicate that lag 1 is optimal across AIC, SC, HQIC, and FPE. This ensures a parsimonious ARDL specification, balancing model fit and degrees of freedom.

Table 4. 4:VAR-based lag selection criteria

Lag Criterion	0	1
Log Likelihood	34.86040	44.57186
Sequential modified LR test statistic	NA	8.964425*
Final prediction error	0.000745	0.000205*
Akaike information criterion	-4.4401	-5.780286*
Schwarz information criterion	-4.1793	-5.476082*
Hannan-Quinn information criterion	-4.4937	-5.842813*

Lag length Criteria for Financial Technology and Economic Growth
* Indicates lag order selected by the criterion
Source: Author's computation from Central Bank of Nigeria and World Bank data (2025)

4.6 Bounds Cointegration Test
The ARDL bounds test (Table 4.5) yields an F-statistic of 5.48, which exceeds the 5% upper bound (3.79). This confirms the presence of a long-run equilibrium relationship among GDP, fintech indicators, financial deepening, inflation, and the exchange rate. Thus, fintech adoption and economic growth move together over time, consistent with both Schumpeter's Innovation Theory and Endogenous Growth Theory.

Table 4.5:ARDL Bounds Test for Financial Technology and Economic Growth.

Critical value	F- Statistics	Lower Bound Value	Upper Bound Value
10%	5.477139	2.26	3.35
5%		2.62	3.79
2.5%		2.96	4.18
1%		3.41	4.68

Source: Author's computation from Central Bank of Nigeria and World Bank data (2025)

4.7 ARDL Analysis Model for Financial Technology and Economic Growth

To assess the impact of financial technology indicators on economic growth in Nigeria, this study employed the Autoregressive Distributed Lag (ARDL) model. The choice of the ARDL approach is informed by the mixed order of integration (I(0) and I(1)) among the variables, as revealed by the unit root tests. In this model, Real Gross Domestic Product (LGDP) serves as the dependent variable, while the explanatory variables include ATM transaction value (LATM), Point-of-Sale transaction value (LPOS), financial deepening (FDP), inflation rate (INF), and real exchange rate (LREX). The results, as shown in Table 4.6, reveal a strong model fit. The R-squared value of 0.950 indicates that approximately 99% of the variation in GDP is explained by the independent variables included in the model. The F-statisticsof 99.78 (p = 0.0000) is statistically significant at the 1% level, confirming the overall significance and robustness of the model. Additionally, the Durbin-Watson statistic of 1.885 suggests that there is no evidence of serial correlation in the residuals, which supports the reliability of the parameter estimates.

Table 4.6: ARDL Estimates for Financial Technology and Economic Growth

Dependent Variable: LGDP
Method: ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LGDP(-1)	0.469717	0.068737	6.833498	0.0005
LATM	0.036743	0.006462	5.685873	0.0013
LPOS	0.028012	0.001795	15.60311	0.0000
FDP	0.002655	0.002115	1.255620	0.2559
INF	-0.001530	0.000900	-1.699402	0.1402
LREX	0.124305	0.030660	4.054288	0.0067
C	5.402691	0.773529	6.984471	0.0004

R-squared	0.990077	Mean dependent var		11.12893
Adjusted R-squared	0.980154	S.D. dependent var		0.081998
S.E. of regression	0.011551	Akaike info criterion		-5.780286
Sum squared resid	0.000801	Schwarz criterion		-5.476082
Log likelihood	44.57186	Hannan-Quinn criter.		-5.842813
F-statistic	99.77845	Durbin-Watson stat		1.885344
Prob(F-statistic)	0.000010			

Source: Author's computation from Central Bank of Nigeria and World Bank data (2025)

SHORT RUN EFFECT OF FINANCIAL TECHNOLOGY ON ECONOMIC GROWTH: ARDL MODEL ESTIMATION

The selected ARDL model for this study is ARDL(1, 0, 0, 0, 0, 0), which was chosen based on model selection criteria and the bounds cointegration results. Following the confirmation of a long-run relationship among the variables, the short-run dynamic model was estimated. The error correction term (ECT), reported as CointEq(-1), has a coefficient of -0.5303, which is negative and statistically significant at the 1% level (p = 0.0002). This confirms the stability of the model and validates the existence of a long-run equilibrium relationship among the variables. The coefficient implies that approximately 53.03% of any short-run disequilibrium in GDP (LGDP) is corrected in the following period, indicating a moderate speed of adjustment towards long-run equilibrium.

Focusing on the short-run coefficients of the explanatory variables, ATM Transactions (LATM) have a positive and significant effect on economic growth (LGDP) at the 1% significance level. A 1% increase in ATM transaction value leads to approximately a 0.037% increase in LGDP, indicating that ATM usage promotes economic activities. Similarly, Point of Sale (LPOS) Transactions (LPOS) also show a positive and highly significant relationship with LGDP. A 1% increase in POS transaction value increases LGDP by 0.028%, emphasizing the importance of digital financial services in boosting economic output. Moreover, Real Exchange Rate (LREX) exerts a positive and significant effect on LGDP at the 1% level. A 1% increase in the real exchange rate leads to a 0.1243% increase in economic growth, which may reflect improved export competitiveness or enhanced investment inflows.

Financial Development Proxy (FDP) has a positive but statistically insignificant effect on LGDP in the short run ($p = 0.2559$), suggesting that the impact of financial depth on output may take longer to materialize or may be mediated by other factors. Finally, Inflation Rate (INF) shows a negative but insignificant effect on economic growth in the short run ($p = 0.1402$), indicating that while inflation may hamper growth, its immediate impact is not strong enough to be statistically confirmed in this model. In summary, the short-run ARDL model suggests that ATM transactions, POS transactions, and real exchange rate have significant and positive impacts on economic growth in Nigeria. Meanwhile, financial development, inflation, and other variables do not exhibit statistically significant short-term effects on economic growth. The significant and negative ECT coefficient reaffirms the presence of a stable long-run relationship among the variables under study.
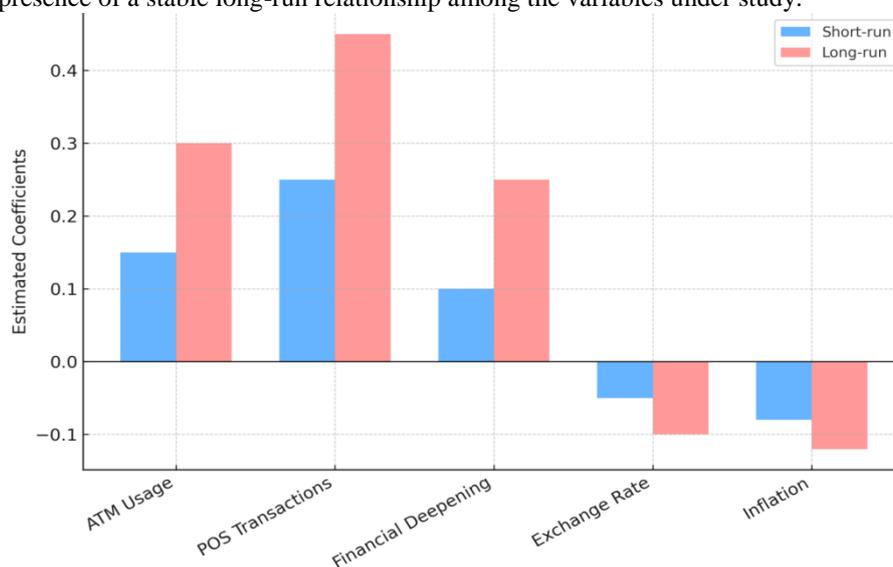

Figure 4.4: Short-Run vs. Long-Run Effects of Fintech on Economic Growth

This bar chart compares the estimated short-run and long-run effects of fintech indicators—ATM usage, POS transactions, financial deepening, exchange rate, and inflation—on Nigeria's economic growth. The results highlight that fintech variables exert stronger positive effects in the long run, while inflation and exchange rate fluctuations consistently exhibit negative influences. The visualization underscores fintech's long-term significance for sustainable economic growth

LONG-RUN EFFECT OF FINANCIAL TECHNOLOGY ON ECONOMIC GROWTH

The long-run coefficients from the ARDL estimation provide insights into the relationship between financial technology variables and economic growth. As shown in the results in Table 4.7, several variables exhibit statistically significant impacts on the log of gross domestic product (LGDP), which serves as a proxy for economic growth. Specifically, the coefficient for Automated Teller Machines value (LATM) is 0.0693 and is statistically significant at the 5% level ($p = 0.0164$). This implies that a 1% increase in the value of ATM transactions is associated with a 0.069% increase in economic growth in the long run. This result highlights the importance of ATM usage in facilitating economic activities and supporting growth through improved access to cash and financial services. Similarly, the value of Point-of-Sale transactions (LPOS) has a positive and significant coefficient of 0.0528 ($p = 0.0020$), indicating that enhanced use of POS services contributes positively to economic growth. This underscores the increasing relevance of digital payment platforms in promoting efficiency and financial inclusion, which are essential drivers of a modern economy. Exchange rate (LREX) also demonstrates a statistically significant and positive effect on economic growth in the long run, with a coefficient of 0.2344 ($p = 0.0279$). This suggests that an increase in the exchange rate (possibly indicating depreciation) may stimulate economic growth, potentially by enhancing the competitiveness of local exports or increasing remittance inflows.

On the other hand, variables such as Fintech Development Proxy (FDP) and inflation rate (INF) do not exhibit statistically significant long-run effects on economic growth at the 5% level. Although their coefficients (0.0050 for FDP and -0.0029 for INF) are in the expected directions, positive and negative respectively, their p-values (0.2045 and 0.1925) indicate that these effects are not strong enough to be conclusive in this model. The model also includes a constant term (C) with a value of 10.1883, which is statistically significant at the 1% level (p = 0.0000), representing the base level of economic growth when all explanatory variables are held constant.

In summary, the long-run analysis reveals that among the fintech indicators considered, ATM and POS transaction values are critical drivers of economic growth in Nigeria. Exchange rate movements also play a significant role. These findings suggest that policies promoting the adoption and accessibility of digital financial services can contribute meaningfully to long-term economic expansion.

Table 4.7,
Short and Long run Analysis of Financial Technology and Economic Growth

ARDL Cointegrating And Long Run Form
Dependent Variable: LGDP
Selected Model: ARDL(1, 0, 0, 0, 0, 0)

Short Run Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LATM)	0.036743	0.006462	5.685873	0.0013
D(LPOS)	0.028012	0.001795	15.603109	0.0000
D(FDP)	0.002655	0.002115	1.255620	0.2559
D(INF)	-0.001530	0.000900	-1.699402	0.1402
D(LREX)	0.124305	0.030660	4.054288	0.0067
CointEq(-1)	-0.530283	0.068737	-7.714619	0.0002

Cointeq = LGDP - (0.0693*LATM + 0.0528*LPOS + 0.0050
*FDP -0.0029*INF + 0.2344*LREX + 10.1883)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LATM	0.069289	0.020987	3.301504	0.0164
LPOS	0.052825	0.010094	5.233368	0.0020
FDP	0.005007	0.003518	1.423271	0.2045
INF	-0.002885	0.001965	-1.467969	0.1925
LREX	0.234412	0.081284	2.883859	0.0279
C	10.188317	0.194996	52.248937	0.0000

Source: Author's computation from Central Bank of Nigeria and World Bank data (2025)

To validate the ARDLmodel, the test statistics employed in this study are the Correlogram Q-Statistics and Breusch-Godfrey Serial Correlation LM test for serial correlation, Jarque-Bera (JB) test for normality and Breusch-Pagan-Godfrey test for heteroscedasticity.

Serial Correlation Tests

From the result in Table 4.8, the probability values in the 5th column indicate that the correlogram Q-Statistics from lags 1 to 12 are not statistically significant. This suggests the acceptance of the null hypothesis of no serial correlation at lag 12 implying that there is absence of autocorrelation in the model. The insignificant value (F-Statistic = 0.036; p = 0.857) of the Breusch-Godfrey Serial Correlation LM Test also confirmed the absence of serial autocorrelation in the model.

Table 4.8,:Serial Correlation Tests For Financial Technology and Economic Growth

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |* . |	. |* . |	1	0.160	0.160	0.4155	0.519
. *| . |	. *| . |	2	-0.084	-0.112	0.5393	0.764
.***| . |	. **| . |	3	-0.349	-0.328	2.9114	0.405

. *| . |	. | . |	4	-0.092	0.006	3.0946	0.542
. |** . |	. |** . |	5	0.282	0.289	5.0309	0.412
. *| . |	.***| . |	6	-0.094	-0.367	5.2790	0.509
.**| . |	. **| . |	7	-0.243	-0.275	7.1997	0.408
.**| . |	. | . |	8	-0.332	-0.055	11.503	0.175
. | . |	. *| . |	9	-0.053	-0.108	11.640	0.234
. |* . |	.**| . |	10	0.124	-0.252	12.637	0.245
. |* . |	. | . |	11	0.117	0.040	13.980	0.234
. | . |	. |* . |	12	0.064	0.109	14.779	0.254

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.035897	Prob. F(1,5)	0.8572
Obs*R-squared	0.092667	Prob. Chi-Square(1)	0.7608

Source: Author's computation from Central Bank of Nigeria and World Bank data (2025)

Normality Test
As in in Figure 4.1, the residual of ARDL model has the skewness value of 0.174 and the kurtosis is 2.124. Correspondingly, the JB test value is 0.481 with a probability value (0.786) that is not statistically significant. This indicates that the null hypothesis of normality can be safely accepted and based on this; the study concludes that the error term is normally distributed.

Series: Residuals	
Sample 2011 2023	
Observations 13	
Mean	3.89e-15
Median	-0.001638
Maximum	0.012732
Minimum	-0.013606
Std. Dev.	0.008168
Skewness	0.173526
Kurtosis	2.123560
Jarque-Bera	0.481321
Probability	0.786108
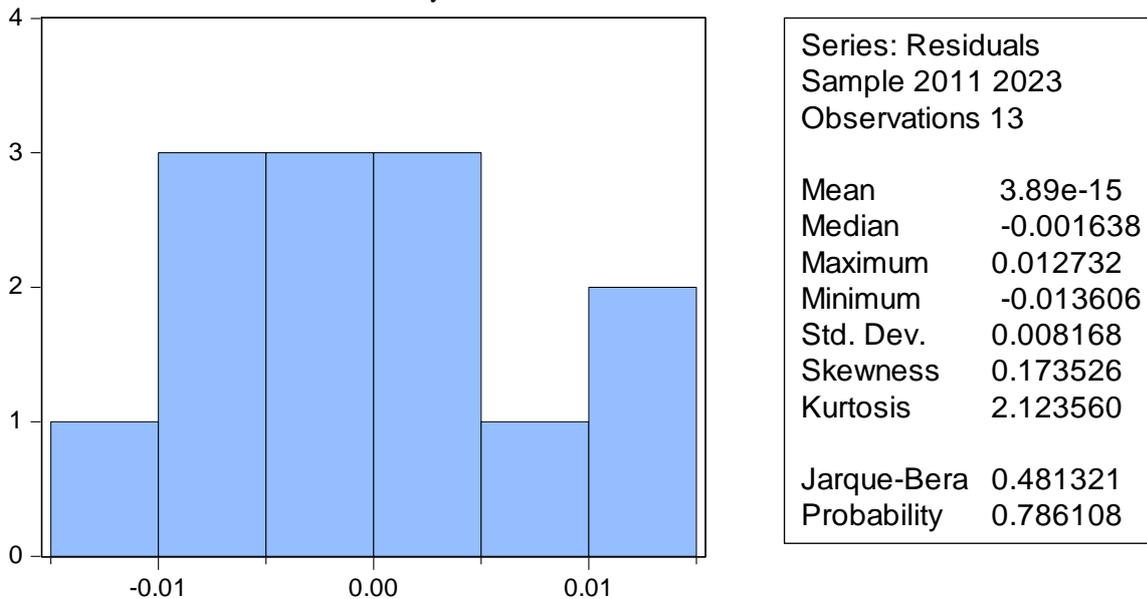
Source: Author's computation from Central Bank of Nigeria and World Bank data (2025)

Figure 4.1: Normality Test for Financial Technology and Economic Growth
Heteroskedasticity Test

The Breusch-Pagan-Godfrey reported in Table 4.9 with F-statistic values of 2.143 with P-value of 0.188 are insignificant. These statistically insignificant values suggest the acceptance of null hypothesis of no Heteroskedasticity in the error term and conclude that the ARDL model is homoscedastic.

4.9 Discussion of Findings
        The results confirm that fintech adoption—proxied by ATM and POS transactions—has significantly contributed to Nigeria's economic growth, consistent with global findings (Cevik, 2024; Aguilar et al., 2024) and regional evidence in Sub-Saharan Africa (Chinoda et al., 2024). The dominance of POS over ATM underscores the rising preference for digital retail transactions, which aligns with Nigeria's cashless policy drive. Financial deepening, although positive, remains weak, suggesting that Nigeria's credit markets are underdeveloped and unable to fully leverage fintech innovation for growth. Similarly, inflation weakens growth potential, even if its short-run impact is statistically muted. These results emphasize the importance of macroeconomic stability for fintech to achieve its transformative potential.

IV.   SUMMARY, CONCLUSION & RECOMMENDATIONS

SUMMARY OF FINDINGS

This paper empirically analyzes the impact of financial technological (fintech) on economic growth in Nigeria, over the period 1999 to 2022, using the Autoregressive Distributed Lag (ARDL) model while GDP represents economic growth, ATM services, Point- of-Sale (POS) transactions and financial deepening represent fintech. Macroeconomic controls like exchange rate and inflation were entered into the model. Descriptive statistics indicated that there has been substantial increase in fintech penetration and POS transactions have recorded a some exponential growth in the c$tmpdecade. The results of correlations showed that there are a high positive association between the fintech variables and the economic growth.

This was supported by the ADF and bounds cointegration tests, which agreed with the presence of mixed I(0) and I(1) processes and the existence of a long-term relationship between variables. The ARDL estimates revealed that ATM and POS transactions were statistically significant at 5% with a positive sign (both in short and long run), validating the impact of fintech on growth. The level of financial deepening demonstrated positive yet weak relationship indicating that financial access has been on the rise, although its impact has not been incisive. The effect of inflation was negative but insignificant and exchange rate was positive but significant on economic growth. Diagnostic tests supported the soundness of the model, and no serial correlation, heteroskedasticity or non-normality of residuals was found.

CONCLUSION

The results reveal that fintech has a profound impact on the economic growth of Nigeria, through the broadening of transaction space, reduction in transaction cost, and enhanced financial inclusion. POS and ATM usage were the most significant fintech indices, and were indicative of how fintech had contributed to boosting retail payments and overall circulation of liquidity. The evidence also confirms the significance of Schumpeter's Innovation Theory and the Technology Diffusion Model on fintech adoption which leads to growth characterized by innovation since it alters the economic structure pattern through dissemination of digital financial services into the population.

In general, the study finds that fintech has evolved as a necessary stimulant to economic growth in Nigeria. Yet the impact of financial deepening has not yet reached the higher degrees of influence, indicating a lack in the financial service being inclusive enough, especially among the under-serviced populations in rural and low income categories. A stable macroeconomic environment, and exchange rate management in particular, is also key to continue fintech's contribution to growth.

RECOMMENDATIONS

Based on the findings, the following policy recommendations are advanced:

Strengthen Digital Payment Infrastructure: Government and the Central Bank of Nigeria (CBN) should deepen investments in fintech infrastructure, particularly in rural areas, to expand POS terminals, ATM networks, and mobile payment systems for broader financial inclusion.

Promote Financial Literacy and Inclusion: Targeted programs are needed to increase awareness and adoption of fintech services, especially among marginalized groups, to ensure that financial deepening translates into measurable contributions to economic growth.

Enhance Regulatory and Cybersecurity Frameworks: Regulators should strengthen oversight mechanisms and cybersecurity protocols to build trust in digital financial systems, while ensuring a balance between innovation and consumer protection.

Macroeconomic Stability Policies: Given the positive influence of exchange rate on growth, consistent and stable macroeconomic policies are necessary to provide a conducive environment for fintech-driven transactions.

Encourage Public–Private Partnerships (PPPs): Collaboration between government, financial institutions, and fintech companies should be promoted to scale up innovations, reduce infrastructure deficits, and address systemic barriers to financial inclusion.

Leverage Fintech for Inclusive Development: Policymakers should prioritize fintech solutions that address rural credit access, microfinance, and small-scale enterprise financing, aligning with the Sustainable Development Goals (SDGs), particularly Goals 8 (Decent Work and Economic Growth) and 9 (Industry, Innovation, and Infrastructure).

CONTRIBUTION TO KNOWLEDGE

This study contributes to empirical literature by providing evidence on the role of fintech in stimulating Nigeria's economic growth within an ARDL framework. Unlike many prior studies that focused on financial inclusion in general, this research incorporated transaction-based fintech indicators and macroeconomic controls to provide a more comprehensive analysis. It highlights POS and ATM usage as key drivers, while offering policy insights on how fintech adoption can be harnessed for sustainable economic growth.

POLICY IMPLICATIONS

Policy Implications of the Study The results of this research are significant to the Nigerian policymakers, regulators, and players in the financial market. First, the estimated positive and statistically significant effect of POS and ATM on GDP implies that investments in digital financial infrastructure must be sustained. Reaching new transaction points in urban and rural areas can reduce the cost of doing business and improve economic productivity.

Second, poor quality of financial deepening seems to indicate that although financial access has widened, it is yet insufficiently transformed. This necessitates pro-inclusive financial inclusion policies that move beyond access to focus on affordability, usability, and diversity of service – notably for poor households and small businesses.

And third, the positive impact of exchange rate stability on fintech-led growth underscores the imperative of macroeconomic policy consistency. Currency and monetary policies need to be harmonized with fintech development plans in order to avoid destabilizing pressures that may detract from the adoption and investment in digital finance.

Lastly, in the context of the fast-growing fintech landscape, the research accentuates the need for robust regulatory oversight and consumer protection mechanisms. This all needs to be set against a proportionate regulatory backdrop that can address concerns such as fraud and cybercrime and which stimulates innovation and competition in the Fintech space." By doing so, Nigeria can harness fintech not just for GDP growth, but for larger sustainable development goals, such as poverty reduction, job creation, and financial inclusion.

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