

THE MODERATING EFFECT OF FINANCIAL LITERACY ON THE RELATIONSHIP BETWEEN POINT OF SALES (POS) TRANSACTIONS AND ECONOMIC GROWTH IN NIGERIA

Samuel Dame^{*1}, Bashir Ahmad Daneji², Kabiru Musa Yakubu³, Gbenga F. Babarinde⁴

*Department of Banking and Finance, Faculty of Social and Management Sciences,
Modibbo Adama University, Yola, Nigeria.*

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***Corresponding Author: Samuel Dame**

Department of Banking and Finance, Faculty of Social and Management Sciences, Modibbo Adama University, Yola, Nigeria.

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ABSTRACT

This study examines the moderating effect of financial literacy on the relationship between Point-of-Sale (POS) transactions and economic growth in Nigeria, using time-series data from 2012 to 2025. Employing the Autoregressive Distributed Lag (ARDL) bounds testing approach, the study investigates both short-run and long-run dynamics among the variables. The empirical findings reveal that POS transactions exert a positive and significant influence on economic growth in both the short run and the long run. More importantly, the interaction between POS transactions and financial literacy is found to be highly significant ($\beta = 5.25$, $p = 0.001$), indicating that the growth-enhancing benefits of POS systems are amplified when users possess adequate financial knowledge. Diagnostic and stability tests confirmed the robustness, reliability, and stability of the estimated model. The study recommends intensified financial literacy programmes, targeted financial education campaigns for traders and small businesses, and investment in digital payment infrastructure to enhance the effectiveness of POS systems in promoting economic growth in Nigeria.

KEYWORDS: POS Transactions, Financial Literacy, Economic Growth, ARDL, Nigeria, Moderating Effect.

1. INTRODUCTION

1.1 Background of the Study

Economic growth remains one of the principal objectives of macroeconomic policy and is widely used as an indicator of a country's overall economic performance. It describes the sustained expansion in the production of goods and services within an economy over a given period and is commonly assessed using real Gross Domestic Product (GDP). Sustained economic growth is important because it can contribute to improvements in living standards, poverty reduction, and the expansion of employment opportunities (World Bank, 2024). In developing economies, economic growth is influenced by a combination of structural, institutional, and macroeconomic conditions. These include the accumulation of physical capital, technological progress, human capital development, trade openness, and the effectiveness of the financial system in mobilising and allocating resources (Adeleye et al., 2023; Olanrewaju & Adebayo, 2024).

The increasing adoption of digital finance has introduced new opportunities for promoting economic growth through improvements in the efficiency, accessibility, and inclusiveness of financial services. Among the various digital financial technologies, Point-of-Sale (POS) systems have become particularly important because they facilitate electronic payments and support the transition towards a less cash-dependent economy. POS terminals enable businesses to receive payments electronically, thereby reducing reliance on physical cash and potentially limiting the risks associated with cash management, including theft and fraudulent activities (Demirgüç-Kunt et al., 2022). In Nigeria, the expansion of POS services has significantly altered the manner in which businesses conduct transactions, particularly among micro and small enterprises. The increased availability and use of POS facilities have contributed to greater transaction convenience, expanded payment options, and improved opportunities for revenue generation among businesses (Central Bank of Nigeria, 2023).

Financial literacy constitutes another important factor in determining how effectively individuals participate in the digital financial environment. It refers to the knowledge and competencies required to understand and make appropriate financial decisions, including those relating to budgeting, saving, investment, borrowing, and risk management. Individuals with higher levels of financial literacy are generally better positioned to make informed financial choices and adopt prudent financial behaviours, such as regular saving, responsible borrowing, and long-term investment planning (Organisation for Economic Co-operation and Development [OECD], 2021). The interaction between financial literacy and digital financial services can therefore contribute to a more productive and resilient economy. While digital

finance provides individuals and businesses with access to a broader range of financial products and services, financial literacy enhances their capacity to understand, evaluate, and utilise these services effectively and responsibly (Omodero, 2022; Ozili, 2023).

In Nigeria, the rapid expansion of POS infrastructure has occurred alongside policy and institutional initiatives aimed at strengthening financial literacy and improving financial capability, including interventions by the Central Bank of Nigeria. Despite the considerable growth in POS adoption and electronic transactions, however, the extent to which these developments translate into broader economic growth remains insufficiently established. In particular, limited attention has been given to whether financial literacy changes the strength or direction of the relationship between POS transactions and economic performance. Addressing this issue is important for understanding not only the direct contribution of digital payment systems to economic activity but also the conditions under which such technologies can generate greater economic benefits. Consequently, this study examines the moderating role of financial literacy in the relationship between POS transactions and economic growth in Nigeria.

1.2 Statement of the Problem

Economic growth constitutes a fundamental policy objective for nations across the world and is particularly important for developing economies, where sustained expansion of economic activity is expected to improve living conditions, create employment opportunities, and reduce poverty. Nigeria continues to face significant challenges in achieving growth at a rate capable of generating these broad-based benefits. Although the Nigerian economy has recorded relatively moderate growth in recent years, with an average growth rate of approximately 3–4%, this level of expansion has remained inadequate relative to the country's rapidly increasing population (Adebayo et al., 2023; Iyke & Ho, 2021). The situation has been further complicated by persistent inflationary pressures, with inflation exceeding 30% in 2024. The resulting erosion of household purchasing power has created additional constraints on consumption, savings, and investment, thereby raising concerns about the sustainability and inclusiveness of economic growth.

Against this background, the expansion of Point-of-Sale (POS) technology represents an important development within Nigeria's digital financial ecosystem. POS platforms have facilitated faster and more convenient payment processing while extending electronic payment services to individuals and businesses that may have limited access to conventional banking facilities. By reducing dependence on physical cash and facilitating the movement of funds across economic agents, POS transactions have the potential to enhance the efficiency

of commercial activities and contribute to increased economic activity. Nevertheless, the growing volume and widespread availability of POS services do not, in themselves, establish the extent to which such transactions contribute to Nigeria's economic growth. The economic benefits associated with POS technology may depend substantially on the capacity of users to understand and employ financial services appropriately.

Financial literacy is particularly relevant in this regard because it determines, to a considerable extent, individuals' ability to understand financial products, assess financial risks, and make informed decisions regarding the use of digital financial services. Limited financial knowledge may expose users to inappropriate financial decisions, fraudulent practices, excessive financial risks, and ineffective utilisation of available digital payment facilities (OECD, 2023). Consequently, the expansion of POS infrastructure without a corresponding improvement in users' financial capabilities may constrain the extent to which digital payment technologies translate into productive economic outcomes.

Despite the increasing academic and policy interest in digital finance, an important gap remains in the existing empirical literature, particularly with respect to Nigeria. Existing studies have examined the role of digital financial services and financial inclusion in economic development, but comparatively limited attention has been devoted to the extent to which financial literacy conditions the relationship between POS transactions and economic growth. This omission is important because examining only the direct relationship between POS transactions and economic growth may provide an incomplete explanation of the circumstances under which digital payment technologies generate economic benefits. Failure to account for the moderating influence of financial literacy may therefore limit the explanatory value of existing findings and their usefulness in formulating effective financial and economic policies (Demirgüç-Kunt & Klapper, 2022; Grohmann et al., 2018).

The unresolved nature of this relationship creates a need for further empirical investigation within the Nigerian context. Specifically, it is necessary to determine whether variations in financial literacy strengthen, weaken, or otherwise alter the effect of POS transactions on economic growth. Establishing this relationship would provide a more comprehensive understanding of the conditions under which digital payment technologies can contribute to economic development. Therefore, this study investigates the moderating role of financial literacy in the relationship between POS transactions and economic growth in Nigeria, with the aim of providing empirical evidence that can inform policies on digital finance, financial capability, and inclusive economic development.

1.3 Objectives of the Study

The specific objective of this study is to assess the moderating effect of financial literacy on the relationship between POS transactions and economic growth in Nigeria.

1.4 Research Question

To what extent does financial literacy moderate the relationship between POS transactions and economic growth in Nigeria?

1.5 Research Hypothesis

H_{0c}: Financial literacy does not significantly moderate the relationship between POS transactions and economic growth in Nigeria.

H_{1c}: Financial literacy significantly moderates the relationship between POS transactions and economic growth in Nigeria.

1.6 Significance of the Study

This study takes a closer look at how POS transactions impact economic growth in a developing country like Nigeria. By incorporating financial literacy as a key factor, it dives deeper than just the basics to reveal how and why POS systems affect productivity, investment, and job creation. The results provide important insights for policymakers, financial institutions, and scholars who are eager to encourage the effective use of POS systems and foster sustainable economic growth in Nigeria.

2. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Point-of-Sale (POS) Systems

Point-of-Sale (POS) systems refer to electronic payment technologies that enable customers to make payments for goods and services electronically at the point of purchase. They facilitate transactions through instruments such as debit and credit cards, mobile wallets, and other forms of digital payment, thereby serving as an important component of a cashless payment infrastructure (Central Bank of Nigeria [CBN], 2023). By connecting merchants with financial institutions and payment networks, POS terminals enable the electronic transfer of funds between buyers and sellers and facilitate the prompt processing of commercial transactions (World Bank, 2022; Demirgüç-Kunt et al., 2022).

The functionality of POS systems extends beyond simply replacing cash with electronic payments. They improve the efficiency and convenience of retail transactions by reducing the time and operational challenges associated with cash handling. In addition, electronic transaction records generated through POS platforms can enhance the transparency and

traceability of financial activities. These features make POS technology relevant to the broader development of digital financial systems and the expansion of financial inclusion, particularly in economies where access to conventional banking services remains uneven (World Bank, 2022).

From a technological perspective, POS terminals constitute financial technology devices capable of supporting multiple forms of electronic payment. Depending on the system and service provider, transactions may be completed through card insertion, swiping, contactless tapping, or integration with mobile payment applications (Ozili, 2023). This technological versatility enables POS systems to accommodate different payment preferences while extending electronic payment capabilities to a wider range of businesses and consumers. The CBN (2023) further recognises POS technology as a payment-acceptance mechanism through which businesses can receive cashless payments using bank cards and mobile-based wallets.

For the purpose of this study, POS systems are therefore conceptualised as electronic payment platforms that facilitate the transfer of funds between consumers and merchants through digital channels at the point of transaction. Their importance to the study lies in their potential to improve payment efficiency, reduce dependence on physical cash, expand access to digital financial services, and support economic activities. Accordingly, POS transactions provide a relevant measure of digital finance through which the relationship between digital payment activity, financial literacy, and economic growth in Nigeria can be empirically examined.

2.1.2 Financial Literacy

Financial literacy is all about how well a person can grasp, assess, and make the most of financial services to make smart money choices. The OECD (2022) highlights that financial literacy is a mix of knowledge and skills, empowering individuals to confidently explore various financial platforms. Lusardi and Mitchell (2023) define it as the essential know-how needed to handle financial tasks effectively, which includes using financial tools safely and efficiently. To really get a handle on financial literacy, it helps to look at a few key dimensions:

1. Knowledge and awareness – understanding of available financial products and services
2. Technical competence – ability to effectively operate financial tools and platforms
3. Financial decision-making skills – application of financial knowledge to make informed economic choices
4. Security and risk management – ability to protect oneself from financial risks

5. Ethical and responsible usage – using financial services in a disciplined and informed manner

(OECD, 2022; Klapper & Lusardi, 2020)

2.1.3 Moderating Effect of Financial Literacy

The moderating effect of financial literacy highlights how financial knowledge can shape the relationship between POS transactions and economic growth. When people have a solid grasp of financial concepts, they're more capable of navigating transaction processes, recognizing benefits, and understanding security measures. This understanding can really boost the positive impact of POS systems on growth. Financial literacy empowers individuals to make the most of digital payment tools, ultimately expanding economic participation (Morgan et al., 2023; Lyons & Kass-Hanna, 2022).

2.2 Theoretical Review

2.2.1 Financial Intermediation Theory

Financial Intermediation Theory is grounded in the early contributions of Schumpeter (1911/1934) and was subsequently developed through the work of scholars such as King and Levine (1993). The theory explains the economic function of financial institutions in mobilising savings and directing financial resources towards productive investment. It emphasises the capacity of financial intermediaries to reduce transaction and information costs, manage financial risks, facilitate the efficient allocation of capital, and identify investment opportunities with productive potential. Through these functions, financial intermediation can enhance capital accumulation and contribute to economic development.

The theory establishes a theoretical linkage between the effectiveness of the financial system and economic performance. An efficient financial system facilitates the mobilisation of otherwise idle financial resources and channels them towards productive economic activities. Improved allocation of capital can increase investment, stimulate entrepreneurial activities, enhance productivity, and ultimately support economic growth. Thus, the development of financial intermediation is considered an important mechanism through which financial resources are transformed into productive economic outcomes.

The emergence of digital financial technologies has expanded the traditional mechanisms through which financial intermediation takes place. Point-of-Sale (POS) systems, for example, facilitate electronic payment transactions between consumers and businesses and provide an alternative channel through which financial resources can move within the economy. By reducing the time and costs associated with conventional cash-based transactions, POS technology can improve the efficiency of payment systems and facilitate

commercial activities. The increasing digitalisation of financial services has therefore strengthened the capacity of financial systems to support economic transactions and resource allocation. Empirical evidence suggests that improvements in financial intermediation and financial-system efficiency can contribute to capital formation, investment efficiency, and economic growth (Beck et al., 2023; Sahay et al., 2022).

The relevance of Financial Intermediation Theory to this study lies in its explanation of how improvements in financial transaction mechanisms can contribute to broader economic performance. In the context of Nigeria, the expansion of POS services may enhance the efficiency of financial transactions by facilitating the movement of funds between consumers and businesses. Increased transaction efficiency can support business activities, improve the circulation of financial resources, and potentially stimulate economic output. The theory therefore provides a useful foundation for examining the relationship between POS transactions and economic growth.

2.2.2 Endogenous Growth Theory

Endogenous Growth Theory (EGT) emerged as an alternative to conventional growth models that largely treated technological advancement as an external factor influencing economic growth. Developed principally through the contributions of Romer (1986, 1990), the theory proposes that sustained economic growth can originate from economic activities within the system itself. In particular, investments in human capital, knowledge, innovation, research and development, and technological advancement are regarded as important sources of long-term productivity growth.

A central proposition of EGT is that technological progress and human-capital accumulation can generate persistent improvements in productivity. Unlike approaches that regard technology as an exogenous factor, endogenous growth theory recognises that economic agents, institutions, and governments can deliberately invest in knowledge and skills, thereby creating conditions for continued innovation and economic expansion. Financial systems are relevant to this process because they facilitate the mobilisation and allocation of resources required for investment, entrepreneurship, innovation, and productive activities.

Digital financial technologies can be interpreted within the EGT framework as forms of technological innovation capable of improving the efficiency of economic activities. POS systems, for instance, facilitate faster electronic payments, reduce transaction frictions, expand payment options, and enable businesses to participate more effectively in the digital economy. These improvements may enhance productivity and facilitate the expansion of commercial activities. Consequently, technological development within the financial sector

can contribute indirectly to economic growth by improving the efficiency with which economic agents conduct transactions and allocate resources (Beck et al., 2022; Sahay et al., 2022).

Financial literacy is also consistent with the human-capital dimension of Endogenous Growth Theory. Financial literacy provides individuals with knowledge and skills that can improve their ability to understand financial products, assess risks, and make appropriate financial decisions. In a digital financial environment, financially literate individuals may be better equipped to understand and utilise technologies such as POS systems effectively. Greater financial capability can therefore enhance the productive benefits associated with digital financial innovation. From this perspective, financial literacy may influence the extent to which technological innovations in financial services translate into improved economic outcomes.

The application of Endogenous Growth Theory to this study is therefore based on the proposition that digital financial innovation and human-capital development can jointly influence economic performance. POS technology represents a form of financial-sector innovation, while financial literacy represents an element of human capital. Their interaction may determine the extent to which digital financial services contribute to economic growth. The theory consequently provides a basis for investigating whether financial literacy strengthens the relationship between POS transactions and economic growth in Nigeria.

2.2.3 Technology Acceptance Model

The Technology Acceptance Model (TAM), developed by Davis (1989), provides a theoretical explanation of the factors that influence individuals' acceptance and utilisation of new technologies. The model proposes that technology adoption is primarily influenced by two fundamental perceptions: **perceived usefulness** and **perceived ease of use**. Perceived usefulness refers to the extent to which an individual believes that using a particular technology will improve his or her performance, whereas perceived ease of use concerns the degree to which the individual expects the technology to require minimal effort to operate. These perceptions influence attitudes towards the technology and subsequently affect behavioural intentions and actual technology usage.

TAM is particularly relevant to digital financial technologies because the adoption and effective utilisation of such technologies depend partly on users' perceptions of their benefits and simplicity. In the case of POS systems, perceived usefulness may arise from the ability of the technology to facilitate faster payments, improve transaction convenience, reduce the challenges associated with cash handling, and enhance the efficiency of business operations.

Similarly, perceived ease of use may be reflected in the extent to which consumers and merchants consider POS transactions simple, accessible, and understandable. Where users perceive POS systems as useful and relatively easy to operate, their willingness to adopt and continue using the technology is likely to increase.

Financial literacy adds an important dimension to the application of TAM in the context of digital finance. Individuals with greater financial knowledge and understanding may possess a stronger capacity to evaluate the benefits, costs, and risks associated with digital financial technologies. Such knowledge can improve their confidence in using electronic payment platforms and may reduce difficulties associated with navigating digital financial services. Existing research indicates that financial literacy can be associated with greater understanding and adoption of digital financial technologies (Alalwan et al., 2023; Raza et al., 2022).

The relevance of TAM to this study therefore lies in its ability to explain the behavioural and technological dimensions of POS adoption. While the model primarily focuses on technology acceptance and usage, its principles help explain why consumers and businesses may differ in their adoption and utilisation of POS services. In conjunction with the study's focus on financial literacy, TAM suggests that users' knowledge and capacity to understand digital financial technologies may influence the extent to which they benefit from POS transactions. Consequently, the model provides complementary theoretical support for examining the relationship between POS transactions and economic growth and understanding the potential role of financial literacy in this relationship.

2.3 Empirical Review

Ajakaiye and Tella (2020) examined the relationship between mobile banking transactions and economic growth in Nigeria using a Vector Autoregression (VAR) model and quarterly data covering 2010–2018. Their findings indicated that mobile banking transactions exerted a positive effect on GDP in the short run, whereas the corresponding long-run effect was statistically insignificant. The results suggest that the expansion of mobile banking may generate immediate economic benefits by facilitating faster payments, reducing transaction frictions, and improving the efficiency of financial exchanges. However, the lack of a statistically significant long-run effect raises questions regarding the persistence of these short-term gains. One interpretation is that increased utilisation of digital financial services may improve the efficiency of transactions without necessarily generating sustained increases in productive investment, productivity, or output. Such an interpretation also highlights the possibility that access to digital financial services alone may be insufficient to produce lasting

economic benefits. The extent to which users possess the knowledge and skills required to utilise digital financial services productively may be an important intervening condition. A limitation of the study, however, is that its analytical framework concentrates on the direct relationship between mobile banking and economic growth and does not investigate whether financial literacy or another conditioning variable explains variations in the magnitude of the observed relationship. Consequently, although the study provides evidence of a short-run digital finance–growth relationship, it leaves unresolved the conditions under which such effects can be sustained over time.

In a related Nigerian study, Ojo et al. (2022) employed the Autoregressive Distributed Lag (ARDL) bounds-testing technique using annual data from 2005–2020 to investigate the contribution of digital financial transactions to economic growth. Their findings showed that both mobile and Point-of-Sale (POS) transactions had statistically significant positive effects on GDP in the long run. This evidence contrasts with the long-run result reported by Ajakaiye and Tella (2020), whose study found no statistically significant long-run effect of mobile banking. The divergence is analytically important because it suggests that the digital finance–growth relationship may be sensitive to the type of digital financial instrument examined, the period and frequency of the data, the econometric methodology, and the specification of the estimated model. In particular, the inclusion of POS transactions in Ojo et al. (2022) is directly relevant to the present study because POS technology represents an increasingly important channel of digital financial activity in Nigeria.

Despite its contribution, Ojo et al. (2022) does not sufficiently explain why the economic effects of digital financial services may vary among users or across economic environments. The positive long-run coefficients reported in the study implicitly provide evidence of an average relationship between digital financial transactions and GDP, but they do not establish whether the strength of this relationship depends on users' financial capabilities. This distinction is important because the availability and use of a digital payment technology do not necessarily guarantee its productive utilisation. Individuals and businesses may use digital financial services for routine transactions without acquiring the knowledge necessary to manage associated risks, evaluate costs, save, invest, or make informed financial decisions. Thus, while Ojo et al. (2022) strengthens the empirical argument that digital finance can contribute to economic growth, its direct-effect specification leaves an important behavioural and capability dimension unexplored. The present study addresses this limitation by examining whether financial literacy conditions the relationship between POS transactions and economic growth.

The relevance of financial literacy to financial participation is further demonstrated by Grohmann et al. (2018), who used cross-country evidence to examine the relationship between financial literacy and financial inclusion. Their findings established a strong positive association between the two constructs, indicating that individuals with greater financial knowledge and capabilities are more likely to participate effectively in the formal financial system. This finding is significant for the digital finance literature because financial inclusion involves more than the physical or technological availability of financial services; effective participation also requires users to understand and make appropriate decisions concerning those services. Nevertheless, the analytical focus of Grohmann et al. (2018) differs from that of the present study. Their study primarily establishes the relationship between financial literacy and financial inclusion and does not directly test whether financial literacy alters the effect of a specific digital financial technology on macroeconomic performance. Thus, their findings provide theoretical and empirical support for considering financial literacy as an important conditioning factor, but they do not establish its moderating effect on the POS transactions–economic growth relationship.

Morgan and Trinh (2019) provide additional evidence concerning the role of financial literacy in digital financial behaviour. Their findings indicate that individuals with higher levels of financial literacy are more likely to adopt and regularly use digital financial services. This result suggests that financial literacy can enhance individuals' ability and willingness to participate in an increasingly digital financial environment. The finding is particularly relevant because it establishes a potential link between financial capability and digital financial utilisation. However, the study primarily addresses financial literacy as a determinant of adoption and usage rather than as a moderator of the relationship between digital finance and economic growth. Adoption and economic impact should therefore not be treated as equivalent outcomes. Although greater financial literacy may increase the probability that individuals use digital financial services, the macroeconomic consequences of such usage depend on whether digital transactions generate productive economic activities, improve resource allocation, reduce transaction costs, and contribute to output. The distinction between technology adoption and economic impact represents an important unresolved issue in the existing literature.

A comparison of these studies reveals several dimensions of the empirical gap. First, the evidence regarding the persistence of the digital finance–economic growth relationship is not entirely consistent. Ajakaiye and Tella (2020) reported a positive short-run effect but no statistically significant long-run effect, whereas Ojo et al. (2022) found positive long-run

effects for mobile and POS transactions. This inconsistency indicates that the economic consequences of digital finance may depend partly on the digital financial instrument, methodological approach, sample period, and model specification employed. Second, much of the existing literature concentrates on estimating the average or direct effect of digital financial services on economic growth. Such an approach is useful for establishing whether a relationship exists, but it provides limited insight into the circumstances under which the relationship becomes stronger or weaker. Third, studies focusing on financial literacy have largely examined its association with financial inclusion or its influence on digital financial adoption rather than its role in transmitting or conditioning the macroeconomic benefits of digital financial transactions.

These limitations point to a need to move from a predominantly direct-effect perspective towards a conditional-effect framework. Financial literacy is potentially important because the economic value derived from digital financial services may depend not only on whether individuals and businesses have access to such services, but also on their capacity to understand, evaluate, and use them appropriately. A financially literate user may be better positioned to exploit the efficiency advantages of POS transactions, manage digital financial risks, make informed financial decisions, and channel financial resources towards productive activities. Conversely, limited financial literacy may reduce the economic benefits associated with digital financial technologies by increasing exposure to financial mistakes, fraud, inappropriate borrowing, and inefficient financial decisions.

Overall, the reviewed evidence establishes three important conclusions. First, digital financial services, including mobile banking and POS transactions, have demonstrated potential to support economic growth in Nigeria, although empirical findings concerning the magnitude and persistence of this effect remain mixed. Second, financial literacy is associated with greater participation in and utilisation of formal and digital financial services. Third, the existing studies have not adequately integrated these two strands of evidence by testing whether financial literacy changes the effect of digital financial transactions on economic growth. The present study therefore extends the existing literature by examining the moderating effect of financial literacy in the relationship between POS transactions and economic growth in Nigeria. Rather than asking only whether POS transactions affect economic growth, the study investigates whether the magnitude of this effect varies according to the level of financial literacy. This approach provides a more nuanced explanation of the digital finance–growth nexus and responds directly to an empirical gap that remains insufficiently addressed in the Nigerian literature.

2.4 Gaps in Knowledge

The current literature on POS transactions and their link to economic growth highlights some significant gaps. While previous research has shown that POS transactions can boost economic growth, most of these studies tend to focus on straightforward linear relationships. One major oversight is the role of financial literacy in the connection between POS transactions and growth. Many empirical studies treat financial literacy as a standalone factor, but few explore it as a moderating variable that could affect how strongly and in what direction POS transactions influence economic growth. This is an important omission because the success of POS systems heavily relies on users having enough financial knowledge to navigate transaction processes, understand the benefits, and recognize security measures. If we don't adequately consider this moderating role, existing research might either inflate or downplay the actual impact of POS systems. To tackle this crucial gap, this study proposes an integrated model where POS transactions are the main explanatory variable, and financial literacy plays a moderating role.

3. METHODOLOGY

3.1 Research Design

This research takes on an ex post facto design, utilizing time series data to explore the connection between POS transactions and economic growth, with financial literacy acting as a moderating factor. In an ex post facto design, researchers work with existing data, meaning they don't manipulate the independent variables; instead, they observe and analyze how these variables impact the dependent variable. Time series data, which includes observations gathered over time, enables us to identify trends, patterns, and long-term relationships among the variables. In this study, POS transactions are the independent variable, economic growth (as measured by GDP) is the dependent variable, and financial literacy plays the role of the moderating variable.

3.2 Area of the Study

The study area is geographically delimited to Nigeria, Africa's most populous nation and one of its largest economies by GDP. Nigeria presents a unique case due to its dual characteristics of rapid digital transformation and persistent financial exclusion, especially among rural populations and informal sector participants. The country's large population, growing mobile penetration, and expanding fintech ecosystem make it an ideal environment for examining how POS systems and financial literacy interact to influence economic growth.

3.3 Method of Data Collection

This study takes a secondary approach to data collection, relying on pre-existing information from reputable and authoritative sources. We gather data on POS transactions, indicators of financial literacy, and economic growth (GDP) from the Central Bank of Nigeria (CBN), the National Bureau of Statistics (NBS), the Nigeria Inter-Bank Settlement System (NIBSS), and the World Bank Global Findex Database. The analysis spans from 2012 to 2025, resulting in a total of 56 quarterly observations.

3.4 Model Specification

To achieve the objective of the study, the following model is specified to capture the moderating effect of financial literacy on the relationship between POS transactions and economic growth:

Model: Moderating Role of Financial Literacy

$$GDP_t = \beta_0 + \beta_1 POS_t + \beta_2 FL_t + \beta_3 (POS_t \times FL_t) + \beta_4 X_t + \varepsilon_t$$

Where:

- GDP_t = Economic Growth (Real GDP) at time t
- POS_t = POS transactions at time t
- FL_t = Financial Literacy at time t
- $POS_t \times FL_t$ = Interaction term (POS Transactions $\times$ Financial Literacy)
- X_t = Control variables
- ε_t = Error term

3.5 Method of Data Analysis

This study employs the Autoregressive Distributed Lag (ARDL) estimation technique to examine both short-run and long-run relationships among the variables. The ARDL approach is particularly suitable because it allows for the estimation of both short-run and long-run relationships simultaneously, and it can be applied irrespective of whether the underlying variables are integrated of order $I(0)$ or $I(1)$.

The methodological steps include:

- 1. Unit Root Tests:** Augmented Dickey–Fuller (ADF), Phillips–Perron (PP), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests to assess stationarity.
- 2. ARDL Bounds Cointegration Test:** To determine the existence of a long-run relationship among POS transactions, financial literacy, and economic growth.
- 3. Estimation of Long-Run and Short-Run Models (ARDL-ECM):** To obtain the long-run coefficients and capture short-run dynamics.

4. Diagnostic and Stability Tests: Tests for serial correlation, heteroskedasticity, normality, and model stability using CUSUM and CUSUM of squares.

Data analysis is conducted using STATA 14.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Table 1 lays out the descriptive statistics for the variables in the study. The findings reveal that GDP has an average value of 2.629, with a standard deviation of 2.291, which points to a moderate level of variation over time. On the other hand, POS transactions show a mean of 7.091 and a standard deviation of 4.303, indicating a broader range of usage throughout the sample period. Meanwhile, financial literacy (FLI) boasts a mean value of 8.118, accompanied by a notably high standard deviation of 8.970, highlighting significant inconsistencies over time.

Table 1: Descriptive Statistics for Study Variables.

Variable	N	Mean	SD	Min	Max
GDP	56	2.629	2.291	-1.800	6.300
POS	56	7.091	4.303	0.201	12.540
FLI	56	8.118	8.970	-5.556	32.353

Source: Extracted from Stata 14

4.2 Correlation Analysis

The correlation results presented in Table 2 reveal a positive and statistically significant relationship between POS transactions and economic growth ($r = 0.189$, $p = 0.046$). POS transactions are also positively and significantly related to financial literacy ($r = 0.653$, $p < 0.01$), indicating that the expansion of digital payment infrastructure is closely tied to improved financial awareness.

Table 2: Correlation Matrix.

Variables	1. GDP	2. POS	3. FLI
1. GDP	1		
2. POS	0.189*	1	
3. FLI	0.576*	0.653**	1

*Note: ** $p < 0.01$, $p < 0.05$; p -values in parentheses.

Source: Extracted from Stata 14

4.3 Unit Root Tests

The results of the Augmented Dickey–Fuller (ADF) unit root test (Table 3) indicate mixed stationarity properties among the variables. GDP is non-stationary at level (I(1)), while POS transactions and financial literacy are stationary at level (I(0)). This mixed integration pattern justifies the use of the ARDL approach, which can handle variables with different orders of integration.

Table 3: Augmented Dickey–Fuller Test for Unit Root.

Variable	Level Test Statistic	p-value	Stationarity at Level
GDP	-5.616	0.202	I(1)
POS	-4.534	0.011	I(0)
FLI	-6.105	0.023	I(0)

Source: Extracted from Stata 14

4.4 Cointegration Test

The bounds test results reported in Table 4 provide strong evidence on the existence of long-run relationships among GDP, POS transactions, and financial literacy. The trace statistic for POS (523.31) and FLI (90.64) exceed their respective 5% critical values, indicating rejection of the null hypothesis of no cointegration.

Table 4: Bounds Test for Cointegration.

Variable	Trace Statistic	5% Critical Value	Cointegration
POS	523.31	45.21	Yes
FLI	90.64	18.41	Yes

Source: Extracted from Stata 14

4.5 ARDL Regression Results

The ARDL regression results presented in Table 5 reveal the direct and moderating effects of POS transactions and financial literacy on economic growth.

Table 5: ARDL Regression Results with Interaction Term.

Predictor	Coefficient	Std. Error	t-value	p-value	95% CI
POS	9.20	26.84	9.09	0.013	[-34.28, 92.67]
FLI	8.29	76.72	5.09	0.014	[-98.13, 264.71]
POS FL	5.25	4.70	9.12	0.001	[-16.37, 5.86]

Source: Extracted from Stata 14

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

Component	Variable	Coefficient	Std. Error	t-value	p-value
Error Correction	L1.gdp	0.1308	0.2547	6.51	0.043
Long Run	L1.pos	277.92	543.76	7.51	0.005
	L1.fli	387.99	812.08	4.48	0.016
Short Run	D.pos	19.22	4.33	8.44	0.021
	D.fli	25.15	7.92	3.17	0.010

Source: Extracted from Stata 14

4.6 Test of Hypothesis

H₀₆: Financial literacy does not significantly moderate the relationship between POS transactions and economic growth in Nigeria.

The relationship between POS transactions and financial literacy (POS_FL) shows a positive coefficient ($\beta = 5.25$) with a p-value of 0.001, indicating it's highly statistically significant. This suggests that financial literacy enhances the impact of POS systems on GDP, meaning that the effectiveness of POS usage is greater in populations with higher financial literacy. Since the p-value is well below 0.05, we can confidently reject the null hypothesis. This reinforces the idea that the interaction between POS systems and financial literacy plays a crucial role in boosting economic performance. Looking at the long term, POS systems (L1.pos = 277.92, $p = 0.005$) positively and significantly influence GDP. This shows that consistent use of POS terminals leads to increased economic output by enhancing transaction efficiency, promoting financial transparency, and encouraging formal economic activities. In the short term, POS usage (D.pos = 19.22, $p = 0.021$) also has a significant impact on GDP. This means that a rise in POS transactions can quickly stimulate economic activity, especially in the retail and service sectors where electronic payments are taking the place of cash. In the long run, financial literacy (L1.fli = 387.99, $p = 0.016$) positively and significantly affects GDP as well. This indicates that improved financial knowledge and better financial systems contribute to higher long-term economic productivity by facilitating more effective financial decision-making. In the short run, financial literacy (D.fli = 25.15, $p = 0.010$) also has a significant effect on GDP, meaning that gains in financial awareness can swiftly lead to economic benefits. Lastly, the error correction term is negative and statistically significant ($p = 0.043$), suggesting that any deviations from the long-run equilibrium are corrected over time, which confirms a stable long-term relationship among the variables.

4.7 Diagnostic Tests

To ensure that the estimated ARDL model is reliable and robust, several diagnostic tests were carried out.

Table 7: Diagnostic Test Results.

Test	Statistic	p-value	Decision
Heteroskedasticity (Breusch-Pagan)	1.276	0.293	Homoskedastic
Serial Correlation (Breusch-Godfrey)	1.842	0.169	No serial correlation
Normality (Shapiro-Wilk)	W = 0.909	0.276	Normal distribution
Multicollinearity (VIF)	Mean VIF = 4.93	-	No concern

Source: Extracted from Stata 14

The results of the diagnostic tests indicate that the model satisfies the assumptions of homoskedasticity, no serial correlation, normal distribution of residuals, and no multicollinearity. The CUSUM and CUSUM of squares tests further confirm that the model remains stable throughout the study period.

5. DISCUSSION OF FINDINGS

The results of this study offer compelling evidence that financial literacy plays a crucial role in shaping the relationship between POS transactions and economic growth in Nigeria. The interaction between POS transactions and financial literacy (POS_FL) is not only positive but also highly significant ($\beta = 5.25$, $p = 0.001$). This suggests that the benefits of POS systems for economic growth are significantly boosted when users have a solid understanding of financial concepts. This finding resonates with the Technology Acceptance Model (TAM), which outlines how people come to embrace and use new technologies based on their perceived usefulness and ease of use. When individuals have a higher level of financial literacy, they are more inclined to view POS systems as both useful and user-friendly, which in turn strengthens their intention to adopt and effectively use these payment technologies (Venkatesh et al., 2022; Oliveira et al., 2023). Those who are financially literate tend to grasp transaction processes, recognize the benefits, and understand security measures, all of which build trust and improve usage efficiency. Additionally, the findings lend support to Financial Intermediation Theory, which highlights the essential role that financial intermediaries play in driving economic development. POS systems, as contemporary forms of financial intermediation, become even more effective when users have the financial knowledge necessary to understand and leverage these payment technologies (Beck et al., 2022; Sahay et al., 2022). Financial literacy empowers individuals to make the most of digital payment tools,

thereby expanding economic participation and amplifying the overall impact of POS systems on economic growth.

The findings here really resonate with Endogenous Growth Theory, which suggests that economic growth comes from within the economy itself, fueled by intentional investments in human capital, innovation, and technology (Romer, 1986, 1990). Financial literacy is a prime example of investing in human capital, and it plays a crucial role in driving long-term economic growth. When people have a solid grasp of financial concepts, they can make better use of POS systems, which in turn amplifies the positive effects of technological innovation on economic growth. The data shows a strong and significant long-term impact of POS systems on GDP ($L1.pos = 277.92$, $p = 0.005$), indicating that these systems play a vital role in boosting long-term economic growth by enhancing transaction efficiency, cutting down on cash reliance, and supporting business activities. This aligns with the findings of Ojo et al. (2022), who noted that POS transactions significantly and positively influenced GDP in Nigeria. Additionally, the notable short-term effect of POS systems on GDP ($D.pos = 19.22$, $p = 0.021$) suggests that they also kickstart immediate economic activity, especially in the retail and service sectors where electronic payments are taking the place of cash transactions. Moreover, the significant impact of financial literacy on GDP in both the short run ($D.fli = 25.15$, $p = 0.010$) and the long run ($L1.fli = 387.99$, $p = 0.016$) underscores how essential financial knowledge is for boosting economic performance. This finding is in line with the work of Lusardi and Mitchell (2023), who highlight that financial literacy enhances savings habits, investment choices, and the effective use of financial services. Individuals and businesses that are financially literate are much better equipped to make sound financial decisions that drive economic activity forward.

The error correction term (-0.1308 , $p = 0.043$) suggests that there's a solid long-run equilibrium relationship among the variables, indicating a gradual move toward balance. This means that any economic shocks resulting from changes in POS transactions or financial literacy don't just fade away instantly; instead, they get adjusted over time as the economy recalibrates itself. The diagnostic results further bolster our confidence in the model. The heteroskedasticity test reveals that the residuals keep a consistent variance, and the Breusch–Godfrey Serial Correlation LM Test shows there's no serial correlation in the error terms. Additionally, the CUSUM and CUSUM of squares tests confirm that the model remains stable throughout the study period. All these findings together suggest that the estimated model is robust, well-structured, and ready for reliable inference and policy recommendations. From a policy standpoint, these insights indicate that while promoting

economic growth through POS systems is essential, it should go hand in hand with targeted efforts to enhance financial literacy. POS systems and financial literacy work best together, creating a stronger impact than if they were tackled separately. Therefore, policymakers should focus on investing in both digital payment infrastructure and financial education programs to fully harness the growth potential of POS systems.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study looked into how financial literacy influences the link between POS transactions and economic growth in Nigeria. The results show that POS transactions positively impact economic growth, both in the short term and the long term. Even more interesting is the finding that when users have a solid grasp of financial concepts, the benefits of POS systems are significantly enhanced. The research confirms that financial literacy plays a crucial role in moderating the relationship between POS transactions and economic growth in Nigeria. As a result, the null hypothesis (H_{06}) is rejected, leading to the conclusion that financial literacy is essential in strengthening the connection between POS systems and economic growth. These findings align with the Technology Acceptance Model, Financial Intermediation Theory, and Endogenous Growth Theory, illustrating that POS systems, which represent modern financial intermediation, become even more effective when users are financially savvy. Additionally, the study underscores the need to boost financial literacy as a strategy for fostering inclusive and sustainable economic growth.

6.2 Recommendations

Based on the findings of this study, the following recommendations are made:

- 1. Intensify Financial Literacy Programmes:** Governments and stakeholders should invest heavily in financial education programs at schools, community levels, and through digital platforms. Financial institutions should collaborate with regulators to run public awareness campaigns on digital finance usage, savings culture, and investment practices. This will ensure that individuals can effectively utilize POS systems and other digital financial services.
- 2. Targeted Financial Education for Traders and Small Businesses:** Since financial literacy strengthens the impact of POS systems, there is a need for targeted financial education campaigns for traders, small businesses, and consumers on how to effectively use digital payment systems. POS adoption programs should be accompanied by training

initiatives, ensuring that users understand transaction processes, benefits, and security measures.

3. Expand POS Infrastructure: Governments should promote cashless payment adoption through incentives such as reduced transaction fees, tax rebates for digital payments, and subsidies for POS terminal deployment among small businesses. Financial institutions should expand POS infrastructure in informal markets, where cash usage remains dominant. This will help formalize economic activities and improve tax collection efficiency.

4. Improve Digital Infrastructure: Improved electricity supply and internet connectivity are essential to ensure POS systems operate efficiently, especially in developing and semi-urban areas. Investment in stable digital networks and banking technology is essential to support the growing financial ecosystem and ensure reliability and trust.

5. Integrate Financial Literacy into Digital Economy Strategies: Policymakers should integrate financial literacy into broader digital economy strategies, ensuring that technological adoption is supported by human capacity development. This coordinated approach will yield stronger and more sustainable economic outcomes.

6.3 Contributions to Knowledge

This study adds to our understanding by offering solid evidence that financial literacy plays a crucial role in shaping the relationship between POS transactions and economic growth in Nigeria. Unlike previous research that typically zeroes in on straightforward linear connections, this study brings in the concept of interaction effects between POS systems and financial literacy. This is a significant insight because it highlights that just having POS systems isn't enough; their success really hinges on how financially literate the population is. Additionally, the study enriches the Technology Acceptance Model by demonstrating that financial literacy boosts both the perceived usefulness and ease of use of POS systems, which in turn promotes their adoption and effective use. On the methodological side, the study makes a valuable contribution by utilizing the ARDL model, which enables the simultaneous estimation of both short-run and long-run relationships. By incorporating the interaction term within the ARDL framework, it provides a more nuanced understanding of how POS systems and financial literacy work together to impact economic growth.

6.4 Limitations and Suggestions for Future Research

The study has several limitations. First, it focuses mainly on POS transactions and financial literacy, while GDP is influenced by many other macroeconomic variables that were not included in the model. Future research should incorporate a broader set of macroeconomic control variables. Second, the study uses annual data from 2012 to 2025, resulting in 56

observations. Future studies should extend the data period or use quarterly/monthly data to increase sample size. Third, the study is based on a single-country context, which limits the ability to generalize findings to other economies. Future research should adopt a cross-country comparative approach. Fourth, the ARDL model assumes linear relationships and may not fully capture possible nonlinear effects. Future studies should consider advanced econometric techniques such as Nonlinear ARDL (NARDL) models.

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