

The Financial Literacy and Financial Inclusion Linkage: Evidence from Niger State of Nigeria

MUSA ABDULLAHI SAKANKO¹, JOSEPH DAVID^{2,*}, SARAH OLANREWAJU ANYANWU³,
MOHAMMED YELWA³, AWADH AHMED MOHAMMED GAMAL²

¹*Department of Entrepreneurship, Federal University of Technology, Minna, Nigeria.*

²*Department of Economics, Faculty of Management and Economics, Sultan Idris Education University, Malaysia.*

²*Department of Economics, University of Abuja, Nigeria.*

This study explores the effect of financial literacy on financial inclusion in 12 local government areas in Niger State of Nigeria using the Probit regression model. The estimation results indicate that higher levels of financial literacy positively and significantly influence financial inclusion in both urban and rural regions. The results also confirm that educational status, employment, informality, social security, poverty, gender, and age are important determinants of financial inclusion. The policy implications of the study include the need for all tiers of government to implement robust financial education strategies to amplify the positive effects of financial literacy on financial inclusion and to mitigate the adverse effects of financial illiteracy. Efforts to achieve higher levels of financial inclusion through improved financial literacy must be complemented by policies which focus on improving job creation opportunities, reducing poverty, promoting gender inclusivity, and fostering an enabling business environment.

Keywords: Financial literacy; financial inclusion; Probit model.

JEL Classification: G2; G21; C25.

* Corresponding author

E-mail address: josephdavid970@gmail.com

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El vínculo entre la educación financiera y la inclusión financiera: Evidencia del estado de Níger, Nigeria

MUSA ABDULLAHI SAKANKO¹, JOSEPH DAVID^{2,†}, SARAH OLANREWAJU ANYANWU³,
MOHAMMED YELWA³, AWADH AHMED MOHAMMED GAMAL²

¹*Departamento de Emprendimiento, Universidad Federal de Tecnología, Minna, Nigeria.*

²*Departamento de Economía, Facultad de Administración y Economía, Sultan Idris Education University, Malasia.*

²*Departamento de Economía, Universiad de Abuja, Nigeria.*

Este estudio analiza el efecto de la educación financiera en la inclusión financiera en 12 áreas de gobierno local del estado de Níger, en Nigeria, utilizando el modelo de regresión Probit. Los resultados de la estimación indican que unos niveles más altos de educación financiera influyen de manera positiva y significativa en la inclusión financiera tanto en las regiones urbanas como en las rurales. Los resultados también confirman que el nivel educativo, el empleo, la informalidad, la seguridad social, la pobreza, el género y la edad son factores determinantes importantes de la inclusión financiera. Las implicaciones políticas del estudio incluyen la necesidad de que todos los niveles del gobierno implementen estrategias sólidas de educación financiera para amplificar los efectos positivos de la educación financiera en la inclusión financiera y mitigar los efectos adversos de la falta de educación financiera. Los esfuerzos para lograr mayores niveles de inclusión financiera a través de una mejor educación financiera deben complementarse con políticas que se centren en mejorar las oportunidades de creación de empleo, reducir la pobreza, promover la inclusión de género y fomentar un entorno empresarial propicio

Palabras clave: Educación financiera; inclusión financiera; modelo Probit.

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[†] Autor de correspondencia

Dirección de correo electrónico: josephdavid970@gmail.com

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1. Introduction

Achieving universal financial inclusion and stability is a complex and multifaceted challenge. Historically, the global discourse centered on increasing individuals' access to financial products and services (see Abu et al., 2022; Demirguc-Kunt et al., 2018; Sakanko et al., 2019, 2024). However, despite improvements in financial accessibility, a significant portion of the population, particularly in developing economies, lacks the necessary skills to effectively manage their finances and utilize available financial services (Andarsari & Ningtyas, 2019; Khan et al., 2022). Consequently, individuals with low financial literacy are vulnerable to financial fraud and exploitation by financial institutions.

Since 2011, there has been remarkable progress in global financial inclusion. The expansion of financial services has been accompanied by increasing efforts to promote account ownership and ensure productive financial engagement. According to the World Bank's Global Findex Database, in 2021, approximately 76% of adults worldwide had an account with a bank, credit union, microfinance institution, or mobile money service provider (Demirgüç-Kunt et al., 2022). This reflects a 50% increase in global account ownership over a decade, from 51% in 2011 to 76% in 2021. In developing countries, account ownership rose from 63% in 2017 to 71% in 2021. In Sub-Saharan Africa, the rapid expansion of mobile money services has played a significant role in this increase. However, despite these advancements, financial literacy remains alarmingly low. Klapper et al. (2020) reported that only 33% of adults globally are financially literate, implying that around 3.5 billion adults lack an understanding of fundamental financial concepts. Furthermore, there is a stark disparity between major advanced economies, where an average of 55% of adults are financially literate, and developing economies, where the figure stands at only 31% (Klapper et al., 2020).

Improving financial literacy is crucial for enhancing financial inclusion. Financial literacy fosters financial awareness, educates consumers on available financial services, and equips them with the knowledge to access and utilize various financial products. Garg and Singh (2018) emphasized that low financial literacy raises concerns about individuals' ability to manage their financial well-being. It increases vulnerability to financial exploitation, debt mismanagement, poor investment decisions, credit difficulties, and inadequate retirement planning (Fanta & Mutsonziwa, 2021). Empirical evidence also indicates that financial literacy has a causal effect on financial inclusion, as financially educated individuals not only better understand the advantages of financial services but also feel more confident engaging with financial institutions (Grohmann & Menkhoff, 2021).

Given its critical role in enhancing financial inclusion, financial literacy has become a priority in policymaking across developing countries (Okere et al., 2020). Improved financial literacy enables households to better navigate financial challenges, manage emergencies, and escape poverty (Garg & Singh, 2018). Additionally, it promotes financial discipline, encourages savings, enhances retirement planning, and reduces financial risk and crime, thereby contributing to overall financial system stability and economic development (Bongomin et al., 2018; Baker et al., 2019; Blue et al., 2014). Inclusive economic growth is more achievable when a larger proportion of the population actively participates in financial markets (Khan et al., 2022).

Despite various financial education initiatives aimed at improving financial literacy, Nigeria continues to struggle with low financial inclusion and financial literacy rates. Between 2011 and 2021, Nigeria's account ownership rate increased marginally from 30% to 45% of the adult population, significantly below the government's 80% target for 2020 (Demirgüç-Kunt et al., 2022). More than half of the adult population remains financially excluded, with financial exclusion more prevalent in rural areas—only 34% of financially included adults reside in rural areas compared to 54% in urban areas. Additionally, Nigeria's financial literacy rate stands at a mere 26%, one of the lowest globally. In comparison, South Africa's financial literacy rate is 42%, Kenya's is 38%, Benin's is 37%, and Togo's is 38% (Klapper et al., 2020). Given Nigeria's economic significance in Africa, this low financial literacy rate is concerning.

The relationship between financial literacy and financial inclusion has been extensively studied in economic literature (e.g., Adetunji & David-West, 2019; Bongomin et al., 2018; Grohmann et al., 2018; Kodongo, 2018; Morgan & Long, 2020). While the findings on the nature of this relationship remain inconclusive, most studies suggest that financial literacy plays a beneficial role in improving financial inclusion, especially in developing economies. In Nigeria, research on this topic has predominantly focused on national-level analyses (e.g., Adetunji & David-West, 2019), overlooking the variations in financial inclusion and literacy at the state level. Given that financial inclusion and financial literacy differ across rural and urban areas, state-level analyses are essential.

Therefore, this study addresses this gap by examining the relationship between financial literacy and financial inclusion at the state level, focusing on Niger State. Niger State, located in Midwestern Nigeria, has a sizable rural population and a significant level of financial exclusion. Over 38% of its residents are financially excluded, and the state has a high rate of formal illiteracy and weak financial literacy (Enhancing Financial Innovation and Access [EFInA], 2019). Additionally, the state faces high levels of multidimensional poverty, affecting approximately 69.1% of the population (National Bureau of Statistics [NBS], 2022). Recent socio-economic challenges, including increased poverty and insecurity due to terrorism, make it crucial to explore the role of financial literacy in improving financial inclusion within the state.

The main objective of this study is to investigate the impact of financial literacy on financial inclusion in Niger State, Nigeria. This research contributes to the financial inclusion literature in several ways. First, to the best of our knowledge, this is the first study to examine the financial literacy-financial inclusion relationship at the state level in Nigeria. Second, to ensure robust results, the study employs the Probit regression technique, a method particularly suited for analysing binary response variables. Finally, by focusing on Niger State, the findings offer valuable insights for policymakers, researchers, and stakeholders. Given the structural, economic, political, and social similarities between Niger State and other Northern Nigerian states, the study's outcomes can be generalized to the broader region, informing financial inclusion strategies across similar socio-economic settings.

The remainder of this paper is structured as follows: Section 2 reviews the relevant literature on financial literacy and financial inclusion. Section 3 outlines the methodology and data sources. Section 4 presents and discusses the empirical results. Finally, Section 5 provides conclusions and policy recommendations.

2. Literature review

Theoretically, financial inclusion is a multidimensional concept. Sakanko et al. (2024) define it as the process of ensuring access, availability, and effective use of essential, affordable, and quality financial services, such as payments, savings, credit, insurance, and loans, particularly for underserved populations. On the other hand, financial literacy refers to the ability to make informed financial decisions and effectively manage personal finances. It encompasses not only knowledge and understanding of key financial concepts but also the skills, confidence, and motivation to apply this knowledge in practice. Atkinson and Messy (2011) describe financial literacy as a combination of awareness, skills, attitudes, and behaviors that support sound financial decisions and improved financial well-being. The relationship between financial literacy and financial inclusion stems from the role of financial knowledge in helping individuals manage limited resources and choose suitable financial products. Financial inclusion involves both access to and use of financial services (Khan et al., 2022). The supply side (access) is shaped by factors such as the proximity of financial institutions, service costs, regulatory frameworks, and the overall depth of the financial system. The demand side (usage) reflects individuals' readiness and ability to engage with financial services. Effective financial inclusion requires that both supply and demand sides function well. While financial infrastructure is essential, individuals must also be capable of making informed financial choices. Financial literacy therefore supports

financial inclusion by equipping individuals to plan, save, and respond to economic risks (Cole et al., 2011; Atkinson & Messy, 2011; Klapper et al., 2013).

On the empirical front, numerous studies have examined the determinants of financial inclusion from various perspectives, including across countries, within countries, and at national levels, using different metrics and estimation techniques. Among the many determinants identified, financial literacy consistently emerges as a significant factor influencing financial inclusion. Several cross-country studies, categorized by development level, geographic region, or economic affiliation, have found a proportional relationship between financial literacy and financial inclusion, whereby lower levels of financial literacy are often associated with reduced financial inclusiveness. For instance, Grohmann et al. (2018) investigated the impact of financial literacy on financial inclusion across 143 countries using ordinary least squares (OLS), instrumental variable (IV), and fractional response regression estimators. Their findings reveal a robust positive effect of financial literacy on financial inclusion, regardless of income levels or country-specific subgroups. Similarly, Hussain et al. (2021) employed OLS and system GMM estimators to explore the nexus between financial literacy, economic freedom, governance quality, and financial inclusion in 98 countries from 2007 to 2018. Their results confirm a positive relationship, further enhanced by strong governance. Other cross-country studies, such as Grohmann and Menkhoff (2017) and Lyons and Kass-Hanna (2021), also report that higher financial literacy facilitates greater financial access and inclusion.

At the national level, various studies have investigated the relationship between financial literacy (including digital and Islamic financial literacy) and financial inclusion (including Islamic and gender-based financial inclusion), particularly in countries like China, Ghana, India, Indonesia, Kenya, Laos, Morocco, Pakistan, and South Africa (e.g., Akakpo et al., 2022; Akande et al., 2023; Al-Sham et al., 2024; Barus et al., 2024; Berry et al., 2018; Bongomin et al., 2020; Chetioui et al., 2025; Kodongo, 2018; Lahiri & Biswas, 2022; Morgan & Long, 2020; Shen et al., 2018; Shibia, 2012; Sukmana & Trianto, 2025; Tulcanaza-Prieto et al., 2025; Widyastuti et al., 2024; Zahid et al., 2024). These studies generally support the finding that financial literacy positively influences financial inclusion.

Within-country studies have produced similar evidence. For example, Hasan et al. (2021) used log-log, Probit, and logistic regression models to analyze the effect of financial literacy in three major Bangladeshi cities (Dhaka, Gazipur, and Narayanganj). Asyik et al. (2022) applied partial least squares methods to investigate how financial behavior and financial literacy affect financial inclusion among rural-urban migrants in Surabaya, Indonesia. Bongomin et al. (2018, 2020) also explored the roles of cognition and social networks in rural Uganda using structural equation modeling. These studies consistently indicate a positive relationship: higher financial literacy leads to greater financial inclusion. However, not all findings are uniform. Some country-specific research suggests a more complex or even negative relationship. For instance, Bongomin et al. (2016) identified an indirect link between financial literacy and financial inclusion, mediated by social capital, in rural Uganda. Similarly, Liu et al. (2021) reported that in Pakistan, increased financial literacy was associated with a decline in financial inclusion.

Despite the growing body of research on the relationship between financial inclusion and financial literacy, relatively few studies have examined this relationship at subnational levels, such as by state or region, within individual countries. In the case of Nigeria, research on this subject at both national and subnational levels remains limited or largely absent. To the best of our knowledge, the only available study in this area is by Adetunji and David-West (2019), which utilized data from EFINA's Access to Finance (A2F) survey, covering responses from over 22,000 individuals across the six geopolitical zones of Nigeria. Their findings indicate that financial literacy has a significant impact on savings behavior in both formal and informal financial institutions. Addressing this gap, the present study seeks to examine the effect of financial literacy on financial inclusion in Nigeria, with a specific focus on Niger State.

3. Methodology

This study adopts a cross-sectional field survey research design. This approach involves collecting responses from individuals at a single point in time, with both the dependent and independent variables measured simultaneously using a structured questionnaire. The choice of a field survey over other research designs is informed by several key advantages. First, it is an effective method for collecting large volumes of data from a broad sample. Second, it provides a practical means of accessing a diverse and representative group within the population. Third, data collected through field surveys possess a high degree of external validity, allowing the findings to be generalized beyond the sample. Fourth, this method is particularly suitable for capturing unobservable variables such as individual preferences, attitudes, beliefs, and behaviours. Finally, field surveys are known for their strong data reliability (Abu et al., 2022).

3.1 Sampling Technique and Sample Size

To explore the effect of financial literacy on financial inclusion in Niger state of Nigeria, the target population comprises all adults in the 25 local government areas (LGAs) of Niger state. With an estimated population of 6,783,300 across the local government areas, it is practically impossible to study all the local government areas. Therefore, a multistage random sampling technique is used for sample selection from the large target population. The multistage random sampling technique involves the division of the population into groups, allowing the researchers to choose the samples purposively at each stage. The method is flexible, cost-effective, and time-effective because it helps to reduce the population into smaller groups from which the researchers can choose.

The multistage random sampling approach is first applied by dividing the State into three regions based on the existing three geopolitical zones in the state (Niger South, East, and North). Both Niger East and North are made up of 9 LGAs, while Niger South consist of 8 LGAs. Next, four LGAs are randomly selected from each of the zones. While the selection of the LGAs is random, population distribution and socio-economic factors (such as economic activities, culture, industries, religion, etc.) play a role in the final decision. Following the procedure leads to the selection of 12 LGAs with an estimated population of 3,952,800. The selected LGAs include: Bosso, Chanchaga, Shiroro and Suleja (for Niger East); Kontagora, Mariga, Magama and Mashegu (for Niger North); and Bida, Lavun, Lapai and Mokwa (for Niger South).

Based on this selected population, the sample size is determined using Slovin's formula which is given as:

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

where N is the population size, n represents the sample size, and e is the error tolerance. In this study, the population (of the selected 12 LGAs) size (N) is 3,952,800 while the margin of error (e) is 0.04 (or 4 percent). While the conventional margin error is 1, 5 or 10 percent, the choice of the 4 percent tolerance error is guided by the fact that they are either too small or large, and unable to provide the desired sample size (Abu et al., 2022).

Therefore, following this procedure, the sample size (n) is approximately 624. The sample frame selected is as broad as the target population. No preference towards gender and religion was made. All adult populations are randomly selected which make up the sample frame. That is, 624 adults are randomly selected to fill in the questionnaires.

The sample frame is calculated as follows:

$$S = \frac{V}{X} \times n \quad (2)$$

where S represents the sample frame. V is the population size of a particular LGA. X is the total population (of the selected 12 LGAs) and n is the sample size. The sample frame of the selected LGAs within the three geopolitical zones is presented in Table 1.

Table 1. Sample frame of selected LGAs

Zone	LGA	Population	Sample Frame	Total
Niger East	Bosso	254,100	40	217
	Chanchaga	346,700	55	
	Shiroro	404,200	64	
	Suleja	368,900	58	
Niger North	Kontagora	260,700	41	203
	Mariga	342,400	54	
	Magama	311,300	49	
	Mashegu	369,100	58	
Niger South	Bida	318,300	50	204
	Lavun	359,800	57	
	Lapai	200,700	32	
	Mokwa	416,600	66	
Total	12	3,237,600	624	624

Source: Authors' computation

3.2 Survey Instruments

A structured questionnaire was employed for data collection. The use of a questionnaire offers a major advantage due to its ability to collect a large amount of information within a limited period (Sakanko et al., 2022). The questionnaire consisted of a series of questions designed to gather relevant information from the target population. It was designed to be simple and respondent-friendly to encourage participation and improve data quality. The questionnaire was divided into two sections. Section A focused on the socioeconomic characteristics of the respondents, while Section B assessed their levels of financial inclusion and financial literacy. To ensure consistency in responses, most of the questions in both sections were close-ended. To gain respondents' cooperation, the purpose and objectives of the study were clearly explained, and participants were assured of the confidentiality and anonymity of their responses. All questionnaires were administered in person by some of the co-authors to ensure accuracy and prompt collection of responses. In cases where respondents had special needs or difficulties completing the questionnaire, oral interviews were conducted by the co-authors or their assistants, and the responses were documented accordingly. For ease of collation and to ensure data accuracy, completed questionnaires were forwarded to a co-author working remotely, who was responsible for preliminary data checks and storage. Questionnaires with incomplete or inconsistent responses were immediately returned for clarification and correction. All collected data were compiled and stored in both hard and soft copies for further analysis. The entire data collection process spanned a period of three months.

3.3 Model Specification

This study is grounded in the financial literacy theory proposed by Simpson and Buckland (2009), which argues that individuals' limited understanding of financial services and products often leads to their reluctance to engage with the financial system. According to the theory, this lack of awareness prevents them from recognizing the potential benefits of participation. Therefore, educating individuals about the functions and advantages of financial products and services is essential for enhancing participation and improving the overall financial system. In line with this theoretical foundation and drawing on the empirical findings of Grohmann et al. (2018) and Morgan and Long (2020), the following econometric model is specified to examine the empirical relationship between financial literacy and financial inclusion:

$$fi_{i,j} = \alpha + \beta_1 fl_i + \beta_2 Z_i + \mu_i \quad (3)$$

where $fi_{i,j}$ represents the extent to which the i th individual is financially included across the j th indicators of financial inclusion. These indicators include account ownership, access to banks and other financial institutions, access to credit facilities, access to mobile phones, and access to internet services. In the literature, financial inclusion has traditionally been measured using variables such as access to financial institutions (e.g., banks), access to credit, and ownership of a bank account (Abu et al., 2022; Ajide, 2015; Sakanko et al., 2024). However, with the growing adoption of mobile money—particularly in developing countries like Nigeria—access to mobile phones and internet services has increasingly been recognized as an important dimension of financial inclusion (Abu et al., 2022; Shen et al., 2018; Widyastuti et al., 2024). The variable fl_i denotes financial literacy, while Z_i is a vector of control variables that influence financial inclusion. Existing evidence in the literature indicates that, in addition to financial literacy, factors such as educational attainment, age, gender, participation in informal economic activities, poverty status, access to social security, and employment status significantly affect an individual's level of financial inclusion (Abu et al., 2022; Bongomin et al., 2018, 2020; Islam & Simpson, 2018; Khan et al., 2022; Klapper & Lusardi, 2020; Sakanko et al., 2019, 2020, 2024). The definitions, measurement approaches, and justification for the inclusion of these control variables are provided in a subsequent subsection. In the model, α denotes the constant term, β_i represents the slope coefficients, and μ is the stochastic error term.

3.4 Estimation Technique

To examine the relationship between financial inclusion and financial literacy, this study employs the Probit regression technique. The Probit model belongs to the family of Generalised Linear Models (GLMs) and utilizes the probit link function, which is based on the cumulative distribution function of the standard normal distribution (De Faria et al., 2020). The choice of the Probit model is justified for several reasons. First, it is appropriate for modeling a binary dependent variable, which is the case in this study (Abu et al., 2022; Dogan et al., 2022). Given the dichotomous nature of the response variable, the use of the standard Ordinary Least Squares (OLS) method would be inappropriate, as it may produce biased and inefficient estimates. Second, the Probit model is preferred because of its flexibility and mathematical simplicity. It is also robust to some of the limitations commonly associated with linear probability models, such as heteroscedasticity, non-normality of the error term, and the interpretational issues related to the coefficient of determination (R^2) (Abu et al., 2022).

Accordingly, the model specified in Equation (3) is estimated using the Probit approach and can be re-expressed as follows:

$$Pr\left(fi = \frac{1}{0}\right) = \pi_0 + \pi_1 fl_i + \pi_2 Z_i + \varepsilon_i \quad (4)$$

where $Pr\left(fi = \frac{1}{0}\right)$ is the probability of being financially included, π is the parameters to be estimated, ε is the error term, and other identities as previously specified.

3.5 Data

This study utilizes a cross-sectional dataset collected from 624 randomly selected adults across 12 local government areas in Niger State, Nigeria. To empirically analyze the relationship between financial inclusion and financial literacy, the variables in the model are defined and measured as follows. Financial literacy is assessed using four questions designed to test knowledge of core concepts in financial decision-making: understanding of interest rates, interest compounding, inflation, and risk diversification. These questions are based on the framework developed by the S&P Global FinLit Survey (Klapper et al., 2016). Each question is

close-ended with four possible responses. Following Grohmann et al. (2018), a dichotomous variable of financial literacy score is generated, taking the value “1” if the responses to at least three out of the four questions are correct and “0” if otherwise. Financial inclusion is measured based on participants' responses to five close-ended questions with two options that assess their access to financial services and products, following the methodology used by Abu et al. (2022). The five indicators include: (i) ownership of an account with a financial institution (e.g., bank, microfinance bank, cooperative), (ii) access to financial institutions (including banks, cooperatives, savings associations, and microfinance institutions), (iii) access to credit facilities (from both formal and informal sources), (iv) ownership of a mobile phone, and (v) access to internet services. Each of the five dichotomous question takes the value 1 if the response is yes, and 0 if otherwise. For aggregate financial inclusion, the variable takes the value 1 if the response to at least one of the five questions is a “yes” and zero if otherwise. Control variables include educational attainment, employment status, engagement in informal sector activities, access to social security, age, gender, and poverty status. Educational attainment, employment status, informality, and social security are captured based on respondents' reported education level, current employment status, participation in informal economic activities, and access to social safety net programs. Age is recorded as reported, and gender takes the values 1 for male and 0 for female. Poverty is measured using the World Bank's international poverty line of US\$1.90 per day. Respondents are classified as poor (assigned a value of 1) if their daily expenditure falls below the Naira equivalent of US\$1.90, and 0 otherwise. While this measure has been criticized for oversimplifying the multidimensional nature of poverty (Edward, 2006), its main advantage lies in its international comparability and widespread adoption for assessing extreme poverty (Abu et al., 2022; Sakanko et al., 2024).

4. Results and discussion

4.1. Descriptive statistics

Before estimating the empirical model to examine the relationship between financial literacy and financial inclusion, descriptive statistics were computed to summarize the characteristics of the respondents. The results are presented in Table 2. The data show that a significant proportion of the respondents (84.29%) reside in rural areas, while the remaining 15.71% live in urban centres. In terms of gender distribution, 331 respondents (53.04%) are male, while 293 (46.96%) are female. Furthermore, approximately two-thirds of the respondents are aged between 18 and 30 years. Regarding marital status, 47.75% are married, while 28.21% are single. In terms of literacy, 58.81% of respondents (367 individuals) indicated they can read and write, whereas the remaining respondents reported they are unable to do so. Despite this relatively high literacy rate, a majority (55.13%, or approximately 344 individuals) reported having no formal educational qualifications. Moreover, unemployment is high among the respondents, with 79.49% indicating they are currently not employed.

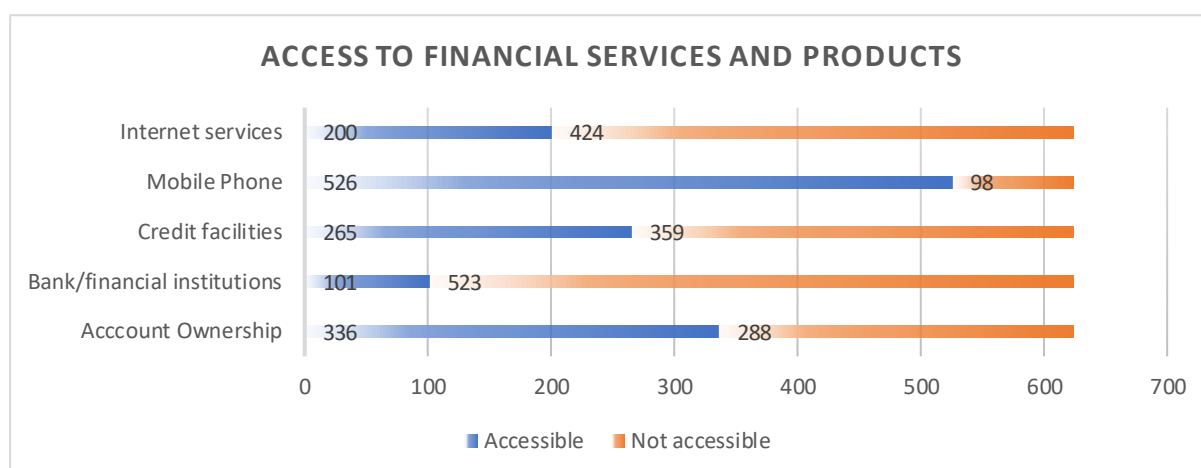
Table 2. Descriptive Statistics

Variable	Obs. (N=624)	Percentage
LOCALITY		
Urban	98	15.71
Rural	526	84.29
GENDER		
Male	331	53.04
Female	293	46.96
AGE		
18 – 30	412	66.03
31 – 50	145	23.2
51 – 60	31	4.96
Above 61	36	5.76

MARITAL STATUS		
Single	176	28.21
Married	298	47.75
Divorced/Separated	134	21.48
Widowed	16	2.56
LITERACY STATUS		
Literate (can read and write, not necessary in English)	367	58.81
Illiterate (can't read and write)	257	41.19
EDUCATIONAL QUALIFICATION		
None	344	55.13
Primary leaving Certificate	47	7.53
Vocational Certificate	1	0.16
Secondary School Certificate	152	24.36
Two-year non-degree diploma	27	4.33
4-year degree certificate	50	8.01
Others	3	0.48
EMPLOYMENT STATUS		
Employed	128	20.51
Unemployed	496	79.49
INCOME LEVEL		
Below US\$10	205	32.85
US\$11 – US\$30	281	44.96
US\$31– US\$60	99	15.84
US\$61 – US\$90	24	3.84
US\$91– US\$120	7	1.12
Above US\$121	8	1.28
SOCIAL SECURITY		
Accessed	278	44.55
Not accessed	346	55.45
CONSUMPTION EXPENDITURE		
Less than US\$0.5	135	2.63
US\$0.51-US\$0.75	207	33.17
US\$0.76-US\$1	100	16.02
US\$1.1-US\$1.90	89	14.26
Above US\$1.90	93	14.90

Source: Authors' computation based on data collected

On income distribution, the majority of respondents earn between US\$31 and US\$60 per month. About one-third earn less than US\$10 monthly, and a very small fraction (1.28%) earn above US\$121 per month. Additionally, only 44.55% of the respondents reported benefiting from some form of social security—such as cash transfers, food assistance, or scholarships—from the government, international organizations, or religious bodies. Regarding daily consumption expenditure, 33.17% (207 individuals) spend between US\$0.51 and US\$0.75 per day. Furthermore, 14.26% spend between US\$1.10 and US\$1.90, while 14.90% spend more than US\$1.90 daily. Based on the World Bank's international poverty threshold of US\$1.90 per day, a majority of respondents fall below this line. Only 22.92% of the sample (143 individuals) spend US\$1.90 or more per day, indicating a high incidence of poverty within the study population.

Figure 1. Extent of respondents' access to financial services and products

Source: Authors' computation based on data collected.

Figure 1 presents the financial inclusion characteristics of the respondents. Approximately 53.85% have an account with at least one financial institution (commercial or microfinance bank). Among account holders, the primary reasons for opening an account include accessing credit facilities and receiving salaries. In contrast, those without accounts cited barriers such as long distances to financial institutions, high service costs, lack of required documentation, and distrust in the financial system. Furthermore, a substantial majority (83.81%) reported having no physical access to banks, financial institutions, or their agents due to the absence of such services in their communities. Nonetheless, 57.53% of respondents reported receiving loans from financial institutions, suggesting some degree of credit access despite the physical limitations. In terms of digital access, 84.29% (526 individuals) own a mobile phone, although only 32.05% have access to internet services. Despite being predominantly rural residents, only 28.37% of respondents reported participating in informal savings groups such as Adashi, Esusu, or Ajo, indicating a relatively low reliance on informal financial mechanisms.

4.2 Estimation and Discussion

To explore the relationship between financial inclusion and financial literacy, six Probit regression models were estimated. The first five models correspond to the five distinct dimensions of financial inclusion considered in this study: (1) account ownership, (2) access to banks and other financial institutions, (3) access to credit facilities, (4) access to mobile phones, and (5) access to internet services. The sixth model uses a composite index aggregating all five dimensions to provide a holistic measure of financial inclusion. The regression results are summarized in Table 3. Columns 1 through 5 present the estimates for the individual components of financial inclusion, while Column 6 reports the results for the aggregate financial inclusion. Diagnostic and goodness-of-fit tests confirm that all six models are free from serial correlation. Additionally, the instruments employed in the models are valid, and each model demonstrates acceptable fit. The pseudo R^2 values, which range between 0.1 and 0.5, indicate that the explanatory variables account for a meaningful portion of the variation in financial inclusion outcomes.

Across all six models, the coefficient of financial literacy is positive and statistically significant at the 5% level, indicating a consistent and robust association between financial literacy and financial inclusion. In the first model (Column 1), a one-unit increase in the likelihood of being financially literate increases the log-odds of owning an account with a financial institution by 0.296, suggesting that financial literacy contributes positively to account ownership. In the second model (Column 2), financial literacy increases the log-odds of having access to a financial institution by 1.314. In Column 3, the results show that being financially literate raises

the log-odds of accessing credit facilities by 0.312. Furthermore, in Columns 4 and 5, financial literacy is associated with increased log-odds of accessing mobile phones and internet services for financial activities by 0.465 and 0.564, respectively. Finally, the sixth model (Column 6), which aggregates all five dimensions of financial inclusion, shows that a unit increase in financial literacy raises the overall log-odds of being financially included by 0.150.

Table 3. Probit regression results of financial literacy and financial inclusion

	Account ownership (1)	Access to bank (2)	Access to credit (3)	Mobile phone (4)	Internet service (5)	Financial inclusion (6)
<i>fl</i>	0.296**	1.314***	0.312**	0.465***	0.564***	0.150***
<i>educ</i>	0.143***	0.126***	-0.078**	-0.103**	-0.120***	0.641***
<i>empl</i>	-0.048	-0.294**	0.390***	0.190	0.098	-0.174
<i>inf</i>	0.154	0.279*	0.206*	0.035	-0.071	-0.094
<i>pov</i>	0.225	0.299*	0.233	-0.087	0.340*	-0.279
<i>sosec</i>	0.089	-0.215	-0.641	0.222	0.265**	-0.058
<i>age</i>	-0.015***	-0.007	0.004	-0.003	–	-0.024***
<i>gend</i>	0.268**	0.228*	-0.150	0.035	-0.244**	0.527***
No. of obs.	624	624	624	624	624	624
Pseudo R ²	0.10	0.50	0.3	0.13	0.4	0.40
LRχ ²	9.05	6.79	12.13	6.52	12.13	10.68
Pχ ²	601.60	1037.34***	576.24	536.56	581.42	367.08
χ ² HL	3.56	13.82	11.00	6.82	11.06	3.32

Note: Asterisks (*), (**), and (***) represent significance at 10%, 5%, and 1% level, respectively. LRχ² is the likelihood ratio chi-squared test statistic. It assesses the model's overall fit and the significance of the independent variables. Pχ² is Pearson chi-square. χ²HL is Hosmer-Lemeshow's goodness-of-fit test statistic. *fl* = financial literacy. *educ* = educational qualification. *empl* = employment status. *inf* = informal activity. *pov* = poverty status (takes the value 1 if daily expenditure is less than US\$1.9 and 0 if otherwise). *sosec* is access to social security. *age* = age of responses. *gend* = gender of respondents (takes the value 1 if male and 0 if female). financial inclusion is the aggregation of the five measures of financial inclusion.

These findings are consistent with previous studies which confirm the critical role of financial literacy in promoting financial inclusion (e.g., Grohmann et al. 2018, Grohmann & Menkhoff, 2017; Hussain et al., 2021; Morgan & Long, 2020). Theoretically, the positive effect of financial literacy on account ownership can be explained by the fact that informed individuals are more aware of the benefits of formal savings, the security of funds, and the risks of financial exclusion. Regarding access to financial institutions, financial literacy enhances individuals' ability to locate and engage with these institutions to perform essential financial transactions, thereby increasing financial participation. In relation to access to credit, financial literacy equips individuals with knowledge on loan application procedures, repayment terms, and the potential for using credit to support investment, manage risk, or improve household welfare. This knowledge makes them more likely to seek and successfully access credit. With respect to mobile phone and internet usage, financial literacy facilitates the effective use of digital channels for financial transactions. Households and individuals who are financially literate are more likely to use mobile banking and internet-based financial services efficiently and securely. Overall, the empirical evidence confirms that financial literacy plays a central role in enhancing financial inclusion. As individuals and households become more financially literate, they become more informed, capable, and confident in using a range of financial products and services, thus deepening their inclusion in the formal financial system.

Regarding the control variables, the results vary depending on the specific measure of financial inclusion. For instance, in Column (6), which presents the model based on the aggregated financial inclusion index, the coefficients of educational qualification and gender are positive and statistically significant, while the coefficient of age is negative and significant. In contrast, employment status, informal sector participation, poverty, and access to social

security exhibit negative but statistically insignificant coefficients. Specifically, the positive and significant coefficient of educational qualification suggests that individuals with higher educational attainment are more likely to be financially included, with the log-odds increasing by 0.641. Similarly, the positive coefficient of gender implies that being male increases the likelihood of financial inclusion by 0.527. Conversely, the negative coefficient for age indicates that as individuals grow older, their probability of being financially included declines, with the log-odds decreasing by 0.024. These findings are consistent with previous empirical findings (e.g., Islam & Simpson, 2018; Khan et al., 2022; Klapper & Lusardi, 2020). Moreover, the findings support the idea that higher education often correlates with basic financial literacy, which facilitates better engagement with financial services. Moreover, in traditionally male-dominated societies, such as the study area, men may enjoy greater access to financial institutions (see Klapper & Lusardi, 2020). On the other hand, older individuals may be more distrustful of formal financial systems, making them more prone to financial exclusion (see Khan et al., 2022). The statistically insignificant effects of employment status, informal sector engagement, poverty, and social security in the aggregate model may reflect the complexity of these variables' influence, possibly due to measurement limitations or context-specific factors that dilute their direct effect on overall financial inclusion.

When examining the results across Columns (1) to (5), which represent the five disaggregated dimensions of financial inclusion, further variations in the influence of control variables are observed. Educational qualification, for example, has a positive and significant effect on account ownership and access to financial institutions. However, its coefficients for access to credit, mobile phone ownership, and internet services are negative and significant. This suggests that while higher education promotes formal financial engagement through account ownership and institutional access, it may not necessarily translate to greater use of mobile or internet-based financial services or access to credit—possibly due to higher opportunity costs or risk aversion among the educated. For employment status, the coefficient is negative and significant for access to financial institutions, but positive and significant for access to credit, and statistically insignificant for other dimensions of financial inclusion. This indicates that while employed individuals may be less likely to rely on financial institutions for general transactions, they are more likely to seek credit, perhaps to support entrepreneurial or investment activities.

Furthermore, the effect of informal sector participation is positive and significant at the 10% level for both access to financial institutions and credit facilities, but insignificant for other financial inclusion indicators. This may suggest that individuals engaged in informal economic activities seek out formal financial institutions for credit or transactional needs. Moreover, the poverty variable shows a positive and significant relationship with access to financial institutions and internet services at the 10% significance level, but no significant association with other dimensions. This somewhat counterintuitive finding may reflect targeted financial inclusion efforts aimed at poorer households, or the use of digital financial services to bridge traditional access gaps. In addition, access to social security is significantly and positively associated with internet-based financial inclusion at the 5% level but shows no significant effect on other forms of financial inclusion. This may imply that social assistance programs help facilitate digital engagement with financial services. Lastly, the effect of age is negative and significant at the 1% level for account ownership, reinforcing the earlier finding that older individuals are less likely to engage with formal financial services. Regarding gender, the coefficient is positive for account ownership and access to financial institutions, but negative and significant at the 5% level for access to internet services, indicating a digital gender gap in financial inclusion.

4.3 Robustness and consistency checks

To assess the robustness and consistency of the Probit regression results summarized in Table 3, a disaggregated analysis based on the respondents' location (urban vs. rural) was conducted. The original sample was partitioned into two subsamples—urban and rural residents—and the six models estimated in Table 3 were re-estimated for each subgroup. The

results are presented in Tables 4 and 5. Diagnostic tests confirm the reliability and adequacy of all estimated models. As with the full sample, six models were estimated for each subsample, capturing both the individual components and the aggregated measure of financial inclusion. In both Tables 4 and 5, financial literacy remains a statistically significant predictor across all dimensions of financial inclusion at the 5% significance level. Specifically, in the urban subsample (Table 4), the estimated coefficients of financial literacy on the log-odds of account ownership, access to financial institutions, access to credit facilities, access to mobile phones, access to internet services, and overall financial inclusion are 1.320, 0.979, 1.376, 1.554, 0.868, and 0.549, respectively. Furthermore, the results indicate that educational attainment, poverty status, access to social security, informal economic activity, and age are significant determinants of financial inclusion in urban areas. In contrast, employment status and gender do not exhibit statistically significant effects across the models in this subsample.

Table 4. The urban probit regression results of financial literacy and financial inclusion

	Account ownership (1)	Access to bank (2)	Access to credit (3)	Mobile phone (4)	Internet service (5)	Financial inclusion (6)
<i>fl</i>	1.320***	0.979***	1.376***	1.554***	0.868**	0.549***
<i>educ</i>	-0.144	0.292*	-0.288*	-0.003	-0.175	0.933***
<i>empl</i>	-0.302	-0.007	-0.212	0.931	0.222	-0.128
<i>inf</i>	0.827	0.842*	1.595**	-2.119**	-0.819*	-0.433
<i>pov</i>	1.017**	0.722*	-0.299	-1.479**	-0.230	-1.296***
<i>sosec</i>	-1.169**	0.656*	-0.065	-0.235	0.822***	-0.010
<i>age</i>	-0.058***	-0.010	-0.034***	-0.008	0.005	0.728*
<i>gend</i>	-0.375	-0.132	0.059	0.316	-0.406	-0.002
No. of obs.	98	98	98	98	98	98
<i>LR</i> χ^2	69.92	65.32	61.61	34.47	19.90	51.59
<i>Pseudo R</i> ²	0.57	0.49	0.47	0.53	0.17	0.39

Source: Author's computation using Stata 14

In Table 5, which presents results for the rural subsample, the estimated coefficients of financial literacy for the same six dimensions are also positive and statistically significant: 1.320 for account ownership, 0.979 for access to financial institutions, 1.376 for access to credit, 1.554 for mobile phone access, 0.868 for internet access, and 0.549 for the aggregate financial inclusion index. As in the urban subsample, educational attainment, informal activity, poverty status, access to social security, and age have significant impacts on the various dimensions of financial inclusion, while employment status and gender remain statistically insignificant.

Table 6. The rural Probit regression results of financial literacy and financial inclusion

	Account ownership (1)	Access to bank (2)	Access to credit (3)	Mobile phone (4)	Internet service (5)	Financial inclusion (6)
<i>fl</i>	0.956***	1.260***	0.634***	0.489***	0.511***	0.181***
<i>educ</i>	0.171***	0.083*	-0.092**	-0.078*	-0.067*	0.725***
<i>empl</i>	-0.039	-0.330**	0.061	0.198	0.069	-0.049
<i>inf</i>	-0.031	0.348**	0.081	-0.047	-0.244*	-0.113
<i>pov</i>	-0.053	0.432**	0.127	-0.174	-0.327**	-0.708***
<i>sosec</i>	-0.060	-0.188	-0.104	0.295*	0.145	0.023
<i>age</i>	-0.011**	-0.006	0.014***	-0.003	–	-0.027***
<i>gend</i>	0.242*	0.192	-0.103	0.056	-0.262**	0.472***
No. of obs.	526	526	526	526	526	526
<i>LR</i> χ^2	279.49	337.81	133.69	59.52	98.57	285.65
<i>Pseudo R</i> ²	0.38	0.48	0.19	0.13	0.14	0.40

Source: Authors' computation using Stata 14

Overall, the findings from both the urban and rural disaggregated samples are consistent with those of the full sample. Financial literacy consistently exerts a positive and significant influence on financial inclusion, regardless of location. However, some variation is observed in the magnitude of the estimated coefficients. In particular, the results suggest that financial literacy has a stronger effect on access to mobile phones, credit facilities, and financial institutions in urban areas. Conversely, in rural areas, financial literacy appears to have a greater impact on account ownership and access to financial institutions, with a relatively lower impact on mobile phone access. These differences may reflect disparities in infrastructure, digital literacy, and institutional presence between urban and rural settings. Nonetheless, the overarching conclusion remains robust: financial literacy plays a central role in enhancing financial inclusion across different geographic contexts.

8. Conclusions

This study investigates the effect of financial literacy on financial inclusion in Niger State, Nigeria, using cross-sectional survey data collected from 624 randomly selected respondents across 224 towns and villages in 12 Local Government Areas (LGAs) of the state. The estimation results, based on the Probit regression model, reveal that financial literacy has a positive and statistically significant effect on financial inclusion, regardless of the measure of financial inclusion considered. When the data are disaggregated by location (urban vs. rural), the findings remain consistent. In addition to financial literacy, the results also show that other factors—including educational attainment, employment status, participation in the informal sector, access to social security, poverty status, gender, and age—exert varying degrees of influence on financial inclusion depending on the specific measure used.

Based on these empirical findings, the study offers the following recommendations. First, governments at all levels should adopt comprehensive financial education strategies to strengthen the positive influence of financial literacy on financial inclusion. These efforts should focus particularly on addressing the adverse effects of financial illiteracy on the usage of financial products and services. However, enhancing financial literacy alone may not be sufficient to improve financial inclusion unless supported by broader macroeconomic reforms. Therefore, macroeconomic policies should be aligned with initiatives that promote job creation, reduce poverty, support gender inclusivity, and create an enabling environment for financial participation. Furthermore, the Central Bank should consider facilitating academic exchange programs and public education campaigns focused on financial products and services. Governments should also invest in improving and subsidizing school enrollment, while expanding access to social protection programs, in order to promote inclusive and sustainable financial participation.

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