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Article

Financial Inclusion and Poverty Alleviation: A Critical Analysis in Nigeria

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Abstract: The study looks at the impact that the three dimensions of financial inclusion (FI) (i.e., access, usage, quality) may have on poverty alleviation. In doing so, the study relies on demand and supply-side data to measure Nigeria's FI. The demand-side data were derived from the 2021 Global Findex data, and the supply side data were sourced from the IMF Access survey database (2004–2021). The supply-side data were analysed using the ordinary least squares regression (OLS), while the demand-side data were analysed using the probit regression model. The study outcomes revealed a negative and significant relationship between financial access and poverty rate, further indicating that those who use financial services are less likely to experience poverty. The study recommends that financial service providers tailor their financial products to align with the educational level of the target population to encourage savings.

Keywords: financial inclusion; access; usage; quality; macro data; micro data



Citation: Omenihu, C.M.; Brahma, S.; Katsikas, E.; Vrontis, D.; Siachou, E.; Krasonikolakis, I. Financial Inclusion and Poverty Alleviation: A Critical Analysis in Nigeria. *Sustainability* **2024**, *16*, 8528. <https://doi.org/10.3390/su16198528>

Academic Editor: Cristina Raluca Gh. Popescu

Received: 24 July 2024

Revised: 16 September 2024

Accepted: 19 September 2024

Published: 30 September 2024



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1. Introduction

Amongst other driving forces of equitable income distribution in an economy, financial inclusion has recently attracted the attention of both scholars and practitioners around the globe [1]. It is considered a crucial factor for improved life quality, thus, alleviating poverty [2–4]. When it develops promptly, financial inclusion advances nations to strategize effectively to improve access to and make use of a diverse array of financial products that were previously limited only to privileged people and nations [5]. Further, financial inclusion is also associated with the significant increase of available financial services, such as utility and wage payments, savings, credit, and insurance, which may also be tailor-made to the needs of people and organisations at a reasonable cost Jia et al., 2021 [6–9].

Despite its merits, financial inclusion's impact on economic expansion is not always favourable (Mehrotra and Yetman, 2015) [10,11]. One school of thought views financial inclusion as an outcome of a less effective use of resources, which is followed by an increase in relevant costs with a subsequent impact on economic growth [12,13]. In this context, a struggling finance-growth nexus is also possible, as financial inclusion requires rapid credit growth or uncontrolled intermediation of funds [11].

Additionally, financial inclusion requires numerous absolute conditions that are not self-evident for all people and nations. As of 2021, over 1.4 billion adults worldwide are formally unbanked and most of them live in developing countries [14,15]. Account

ownership in sub-Saharan Africa (SSA) experienced a significant growth rate, doubling over a decade (from 23% in 2011 to 55% in 2021); however, SSA remains among the three regions with the lowest account ownership and usage rates across the world [10].

Based on the report by Global Findex [10], Nigeria, the most populous country in SSA, is amongst the group of seven economies that collectively account for 50% of the unbanked global population. Nigeria has one of the world's lowest and most uneven FI rates, with a significant percentage of adult Nigerians (36%) found to be financially excluded [16,17]. Based on Global Findex, approximately 39% of Nigerians do not have an account, while 65% of Nigerian adults do not save at a financial institution. The lack of chances for individuals to ensure account ownership is associated with many negative social phenomena, including ongoing poverty, financial illiteracy, increased gender inequalities, scarce educational opportunities for young adults, and residency in rural areas [18]. Apart from such explicit negative outcomes, financial exclusion is also responsible for several implicit and hidden negative consequences, which may include, but are not limited to the lack of knowledge of available banking products, high charges on bank accounts and limited presence of bank branches in rural areas [19,20].

In countries such as Nigeria, which are widely acknowledged as main contributors to poverty in SSA, financial inclusion is hard to achieve [21,22]. Current evidence supports that Nigeria, together with Democratic Republic of the Congo, is dealing with an extreme poverty rate that is estimated to grow to 30% by the end of 2030 [23]. Moreover, the existing literature acknowledges a variety of barriers to financial inclusion, which includes documentation issues (31%), inaccessible distance to various institutions (36%), cost of services (31%), as well as trust issues (18%). Countries which constantly deal with an increased poverty rate may not ensure the necessary structured mechanism that financial inclusion requires. Yet, such inability may not exclude Nigerians and others from equitable income distributions in an economy, thus, developing a negative trend of financial exclusion.

As sustainability emerges in almost all aspects of our life, the most important sustainable development goal is to end poverty in all its types by 2030. Despite the promising societal targets, 133 million people in Nigeria experience multidimensional poverty (Nigeria Bureau of Statistics, 2022) [24]. The World Bank further reveals that 40% of Nigerians live below the poverty line [14]. There is also a misunderstanding that poverty can be equated solely with a lack of monetary earnings. In particular, poverty is reflected in people's inability to access and effectively use appropriate financial services to lift themselves out of poverty [25].

The promotion of financial inclusion, not only as a concept but also as a tangible societal outcome, is found to be a focal parameter for alleviating poverty in emerging nations such as in Nigeria. The existing literature demonstrates a relatively structured framework to study financial inclusion by supporting its multidimensional nature based on the three dimensions the G20 Group provides, namely, access, usage, and quality. However, empirical evidence on how these three dimensions of financial inclusion affect poverty in Nigeria are relatively scant. Even if scholars attempt to shed light on how the three financial inclusion dimensions affect poverty, a holistic approach has not yet been achieved [26,27]. Some scholars, focused only on the dimension of [21,28,29], while a significant body of research added the usage dimension in this relationship [30–32]. To the best of our knowledge, the existing literature also lacks evidence in support of the third dimension of FI, that is quality.

Despite the lack of a holistic approach of financial inclusion as a construct, financial inclusion affects many emerging nations and people around the contemporary world. However, the majority of the existing studies concentrated on isolated geographical parts of Nigeria (not on the whole country) [19,33,34]. Although such studies provide meaningful evidence in this emerging line of research, they have not provided evidence from a cross-country approach. Consequently, the generalisability of their outcomes is not very well supported.

In an attempt to contribute to the emerging line of research on financial inclusion, we use a holistic approach to investigate the impact of financial inclusion on alleviating poverty and strive for data generalisability. In so doing, first, we consider financial inclusion as a construct with two main dimensions, as proposed by the G20 Group. Then, we take the geographical area of Nigeria as the case of analysis. Drawing on the principles of trickle-down theory, neoclassical theory, and the finance-growth nexus, the study aims to investigate the impact of financial inclusion on alleviating poverty. We argue that the relationship between financial inclusion and poverty presents an overarching correlation with consequences on the entire economy rather than being limited to a particular region. In addition, financial inclusion may affect poverty only when viewed through all three of its dimensions as absolute conditions, without focusing on isolated dimensions. To measure all three dimensions of financial inclusion, we used the most recent and extensive household survey data (Global Findex) (10) from 1000 Nigerian families in 2021, as well as data from the IMF Access study (2004–2021) (IMF, 2023) [10,35].

The study's contributions are threefold. First, it analyses the multidimensional nature of financial inclusion [36,37], and then it considers its main dimensions (i.e., access, usage, and quality) holistically to evaluate how financial inclusion contributes to poverty reduction. Although such dimensions hold significant importance, they have not been analysed together in nations that are dealing with issues of accessibility to public services and have not ensured the quality of financial services for their citizens [38].

Second, and to the best of our knowledge, our study is among the first attempts making use of microdata (Global Findex, 2021) and macro data (IMF survey database, 2004–2021) to evaluate the impact of financial inclusion on alleviating poverty [10,35]. While macro indicators provide policymakers with the proper framework to assess the overall status and extent of financial inclusion, the micro perspective sheds light on the outreach initiatives and limitations of financial inclusion development [39]. The Global Findex includes the most recent and extensive household data from 1000 Nigerian families in 2021 and measures usage and quality dimensions [10]. The IMF Access study (2004–2021) measures the dimension of access.

Third, the study looks at the entire country and, therefore, it minimises the generalisability gap that other studies present [37,40], and it argues that the relationship between financial inclusion and poverty is an overarching issue affecting the entire economy, and it must not be isolated to a particular region.

The remainder of the study is structured as follows: Section 2 is an extensive review of the pertinent literature. Section 3 outlines the research methodology and methods which are applied in this study. The study outcomes are presented and discussed in Section 4. Finally, Section 5 concludes the study.

2. Literature Review and Hypotheses Development

2.1. Theoretical Frameworks on Financial Inclusion (FI) and Poverty

The existing literature acknowledges a variety of theories supporting the relationship between financial inclusion and poverty. The majority of the studies which attempted to evaluate the effect of financial inclusion on alleviating poverty have used the theories mentioned earlier as a foundation for analysing such relationships [28,41–43]. Yet they fail to provide a unanimous theoretical framework to explain the impact of financial inclusion on poverty.

At a macro-level, the **trickle-down theory** was found to be among the most well-used theoretical frameworks that explains plausible effects of FI on poverty. It supports that macro-level structural economic policies must trickle down to the micro-level to directly affect individual financial welfare [44]. The departure from the macro- to micro-level is reflected in various policies which use taxation and other payment methods to help low-income families afford their basic needs [45]. The trickle-down rationale explains the macro-level actions undertaken by financial institutions to ensure impoverished people access to a variety of financial services. The theory supports a direct relationship between

financial inclusion and the alleviation of poverty by taking financial institutions as a mediator. It further argues that an increase in economic activity requires the private sector to receive an advance of bank credit and increase in investments made to it. The latter creates a dynamic economy that lowers unemployment, raises wages, and reduces poverty by providing people who experience poverty with more money to spend [46,47].

Following the principles of **neoclassical theory**, financial inclusion may reduce poverty by growing human capital and redistributing wealth to poor and resource-poor firms [39,48]. The rationale behind the theory also assumes that people make reasonable purchase decisions and, subsequently, markets run efficiently. Therefore, it explains financial exclusion as an outcome of individual irresponsibility and/or government inefficiency [49]. Government rules, such as interest rates, limits, and inflation policies may distort credit markets and exclude some individuals from loan access. If the costs outweigh the benefits, consumers may choose unofficial funding over standard financial services [50].

Both trickle-down theory and neoclassical theory are complemented by the **finance-led growth theory**. Both Bagehot and Schumpeter supported that limited access to financial resources causes income disparity [50,51], which is followed by slow economic growth. Financial resources must be secure, accessible, and affordable to accelerate progress and reduce income disparity and poverty. Therefore, financial inclusion promotes equity, empowers economically and socially marginalised people to engage in the economy, and encourages others to contribute to development while protecting themselves from financial disasters [25].

2.2. Financial Inclusion and Poverty

The existing literature provides empirical evidence in support of the impact of financial inclusion on poverty at either the country level, such as Nigeria, or at global, multinational levels. However, such study outcomes have been found to be controversial rather than unanimous. One point of view finds that financial inclusion reduces poverty significantly, while another viewpoint finds that financial inclusion is not an eligible factor in reducing poverty.

Specifically, the current literature suggests that the accessibility and the usage of financial inclusion are major contributors to poverty reduction in most Asian countries [52]. Based on an index that was compiled between 2004 and 2019, the same outcomes are also valid for various European areas [53,54]. These studies also support that the level of financial inclusion and poverty prevalence are negatively correlated, concluding that education helps impoverished people by improving their chances of entering the workforce. Other panel data from 116 developing nations from 2004 to 2016 found the same outcomes [25]. Ouechtati used panel data from 53 developing countries and agreed that bank credit and deposit accounts significantly reduce poverty [55]. More recently, based on data from the 2017 China Household Financial Survey and a financial inclusion index for micro-households, supported that digital financial inclusion significantly reduces poverty in China [56].

Contrary to the aforementioned findings, other studies do not support the positive impact of financial inclusion on poverty. Specifically, a study conducted in Saudi Arabia concluded that financial inclusion had no appreciable bearing on poverty [57]. Despite previous research in Asia, recent studies on ten Asian nations showed that financial inclusion cannot reduce poverty [57,58]. Along the same lines, Neaime and Gaysset investigated the effects of financial inclusion on poverty in eight MENA countries from 2002 to 2015 without observing any support for such relationships [59]. Instead, they found that poverty is increased by inflation.

The relationship between financial inclusion and poverty is also not supported in the case of Indonesia [60]. Instead, an increase in financial inclusion is also followed by an increase in poverty. Such relationships were supported recently by Saha and Qin [61], who examined the effect of financial inclusion on poverty reduction in 156 nations of varying income levels from 2004 to 2019. The authors suggested that financial inclusion has a

positive but insignificant relationship with extreme poverty in high-income countries. The index that was created by Mahalika et al. using Fin Scope data from 2011 to 2016 showed that the poorest Africans were more likely to live in rural regions and have a lower level of education than to pursue access to financial inclusion [62].

2.3. The Case of Nigeria

Focusing on the case of Nigeria, current research also presents conflicting views on the relationship between financial inclusion and poverty. For instance, the impact of financial inclusion on rural Nigerian poverty was positive from 1996 to 2013 [33]. A study conducted in Nigeria's Kebbi State using data collected from self-administered questionnaires also supported such a positive relationship [34]. Furthermore, Abimbola et al. analysed financial inclusion's effect on Nigeria's poverty alleviation from 1992 to 2016 [28], Aribaba et al. analysed it from 2004 to 2019 [29], and Bello et al. did the same from 2002 to 2019 [21]. They each showed that increased access to financial services decreased poverty in Nigeria. Other scholars supported the notion that access and usage of financial services may also reduce poverty [31]. In this vein, Eze and Alugbuo used the World Bank's 2017 Global Findex survey to also assess financial inclusion's impact on poverty in Nigeria [40], indicating that financial inclusion reduced Nigerian household poverty.

However, as discussed above, research outcomes are not unanimous. The existing literature presents conflicting views of the impact of financial inclusion on poverty in Nigeria's case. A study that was conducted among SMEs operating in Akwa Ibom State showed that bank loans to business owners are not enough to reduce poverty [19]. Similarly, Sakanko et al. [32], using quarterly data from 2007 to 2018, analysed the effect of financial inclusion on inclusive growth in Nigeria and suggested that access to financial services increases poverty. In the long run, however, the outcomes differ on whether financial usage reduces poverty. Other scholars in the field confirm the same outcomes using access and usage as independent variables to poverty and the VAR technique to analyse such relationships [30].

Although there are conflicting opinions on the impact of financial inclusion on poverty, it might be useful to consider and explain the differences between fiscal years. A recent study supported that Nigeria's financial inclusion indicators increased in 2014, but after 2017, a decrease in financial inclusion indicators was observed [16]. Such a decrease was seen for both females and males, older people, and uneducated people who failed to perform well across all financial inclusion parameters.

Current research acknowledges all financial inclusion dimensions as equal variables with plausible effects on poverty, but the majority of scholarly research focuses on the access dimension, excluding from their conceptual frameworks the other two dimensions, i.e., usage and quality [21,28,29]. The lack of a holistic approach to financial inclusion is also observed in other studies focused on access and usage dimensions without measuring the dimension of quality of financial inclusion [30–32,40]. Such studies should have acknowledged that both access and usage dimensions do not necessarily equate to complete financial inclusion; however, such an observation was not included in their outcomes. A thorough understanding of the impact of financial inclusion on poverty should depart from the one-dimensional model that merely serves as a gateway to the formal financial system [63]. Rather, financial inclusion should be treated as a comprehensive policy that extends beyond each proxy [64].

Apart from the lack of a holistic view, scholars focusing on Nigeria provide evidence from only one of the states [18,32,34]. Despite their significance, such outcomes lack generalisability.

Taking the entire area of Nigeria as the case of this study, the discussion above is summarised by the following three hypotheses:

Hypothesis 1. *Financial usage has no significant effect on poverty alleviation.*

Hypothesis 2. *Quality of financial services has no significant effect on poverty alleviation.*

Hypothesis 3. *Financial inclusion has no significant effect on poverty alleviation.*

3. Methodology and Methods

3.1. Data and Model Specification

Some researchers focused on the demand-side of financial inclusion [18,65], whereas others focused on the supply-side [30–32]. Among the most recent studies, Sharma and Changkakati focused on both the demand and supply side and used the most recent data, Global Findex data [37]; however, it was a panel study, not particularly on Nigeria. Following the most recent research trends, our study focuses on both supply and demand aspects of financial inclusion in Nigeria. The data used for the supply side dimension (FINACC) were sourced from the IMF Financial Access Surveys (FASs) spanning from 2004 to 2021, and the demand side (FINUSE and FINQUA) data were sourced from the 2021 Global Findex.

The IMF FAS is the most extensive supply-side data on financial inclusion in the world; it contains data on 189 countries and regions from 2004 to 2021, with 121-time series and 64 indicators; measures on the number of automated teller machines (ATMs), bank branches, microfinance institutions, credit unions, and insurance companies; and other types of financial service providers are all represented in the data [35].

Conversely, the Global Findex includes the most comprehensive data on demand-side financial inclusion [10]. The Global Findex, launched by the World Bank in 2011, tracks how individuals in 140 countries save, borrow, pay, and manage financial risks. Approximately 1000 individuals over 15 years of age were polled in each country. The Global Findex, conducted every three years, tracks socioeconomic characteristics such as financial inclusion barriers, formal financial service use, and quality.

The study specified two models in order to address the research objectives and a fitted graph to understand the relationship between financial access and poverty rate. The graph assesses the effect of financial access on poverty, and it uses macro-level data derived from the IMF Access survey. The specific timeframe was selected based on data availability relevant to study variables. Model 1 captures the effect of financial usage and quality on poverty. Finally, Model 2 is used to capture the effect of the financial inclusion index on poverty. Models 1 and 2 utilised micro-level data (2021 Global Findex data).

3.1.1. Financial Access (FINACC) and Poverty

Sharma and Changkakati [37] adopted a single model that encapsulates the three dimensions of financial inclusion using panel data. Their approach to measuring financial access involved several key indicators: the number of accounts, ATMs per 1000 square kilometres, branches per 1000 square kilometres, the number of commercial bank branches per 1000 square kilometres, ATMs per 100,000 adults, branches per 100,000 adults, and the number of insurance corporations per 100,000 adults. However, we employed a distinct approach due to the use of two different datasets: a macro dataset at the country level and a micro dataset at the household level. Specifically, the relationship between poverty rate and financial access was measured using a fitted graph, while Models 1 and 2 were applied to assess the remaining two dimensions of financial inclusion (financial usage and quality). This division in the application of models was necessitated by the availability and suitability of the datasets for capturing the various aspects of financial inclusion. The macro dataset facilitated the use of broader, country-level indicators. In contrast, the micro dataset enabled a more granular, household-level analysis, aligning with the availability of relevant data for each aspect of financial inclusion.

3.1.2. Financial Usage and Quality on Poverty Alleviation

Model 1 below examines the relationship between financial usage (FINUSE) and poverty, as well as the relationship between quality (FINQUA) and poverty. This model

was developed to address the second and the third research questions and is a modified version of Mahalika et al. and Eze and Alugbuo [40,62].

$$POOR = \beta_0 + \beta_1 FINUSE + \beta_2 FINQUA + \beta_3 EDU + \beta_4 EMP + \beta_5 RURAL + \beta_6 AGE + \beta_7 GEN + \varepsilon \quad (1)$$

where POOR = income quintile of the household, FINUSE = Financial Usage, FINQUA = Quality, EDU = Educational level of the respondent, EMP = Employment status of the respondent, RURAL = Where the respondent lives, AGE = Age of individual respondent, GEN = Gender of the respondent A detailed summary of the variables measures is provided in Appendix B.

3.1.3. Financial Inclusion Index on Poverty Alleviation

Model 2 below is used to examine the connection between overall financial inclusion index and poverty in Nigeria.

$$POOR = \beta_0 + \beta_1 FI + \beta_2 EDU + \beta_3 EMP + \beta_4 RURAL + \beta_5 AGE + \beta_6 GEN + \varepsilon \quad (2)$$

where FI = the overall financial inclusion index. FI is a combination of FINQUA and FINUSE. The other variables in the equation are defined as in Model 2 above.

It is expected that financial inclusion will exhibit an inverse relationship with poverty, as greater availability of financial services to individuals with lower incomes typically contributes to poverty reduction by enabling consumption and participation in economically viable endeavours [25].

3.2. Strategy of Data Analysis

In line with the existing literature [37,53,54], the three dimensions of financial inclusion (usage, and quality) are individually taken as independent variables. Principal component analysis (PCA) was utilised to construct an index for each dimension of financial inclusion (access, usage, quality) by combining many indicators for each dimension. Additionally, an overall financial inclusion index was constructed to ascertain its association with poverty. Appendix A shows indicators for financial access (FINACC), while Appendix B describes indicators for FINUSE and FINQUA. The study also used the indicators of FINUSE and FINQUA to build an overall inclusion index (FI). PCA is employed to decrease the dimensionality of the data, given that FI is a complex idea. It is a valuable technique for minimising the number of variables that convey the same concept while retaining a significant amount of data [66]. PCA offers a significant benefit by circumventing the issue of multicollinearity that arises when multiple financial inclusion variables, exhibiting high correlation, are introduced at once [67]. The Kaiser–Meyer–Olkin (KMO) criterion of sample adequacy and Bartlett’s test of sphericity were also applied to ensure that data derived for the study were appropriate for PCA procedures [68,69]. At the same time, the study analysed the micro data (demand side) from the 2021 Global Findex, using the probit regression model.

Binary Regression Analysis for Models 1 and 2

Models 1 and 2 include a binary dependent variable, “POOR”, where 0 is “poor” and 1 is “non-poor”. The linear probability model (LPM) and the Logit and Probit regression models are the three main models for binary dependent variables estimation. LPM cannot account for the population regression function’s nonlinearity, which may cause it to forecast probabilities outside the given interval [70,71].

However, Probit and Logit models are challenging to grasp, but these models capture nonlinearities better than LPM and estimate probabilities inside the interval [72]. Probit and Logit models differ in the connecting function. The Probit model employs the cumulative normal distribution’s Probit function, while the Logit model uses the inverse of the logistic distribution’s cumulative logistic function [73]. Nevertheless, the distinction between the two can be ambiguous [72].

Since the dependent variable is binary (0-POOR and 1-NON-POOR), the Probit model both in Models 2 and 3 [7,73]. Heteroscedasticity, non-normality of the error component, and questionable R-square do not limit the model [7].

4. Results

4.1. Descriptive Statistics

4.1.1. Descriptive Statistics for Financial Access Variables

Data used for this analysis were derived from the IMF Access survey data. The descriptive statistics of the financial access index variable are presented in Table 1.

Table 1. Descriptive statistics for access variables and regressors.

Variable	Mean	Std. Dev.	Min	Max
GDP per capita	479.096	92.551	281.3254	590.630
Number of insurance corporations	62.333	20.158	48	103
Number of bank branches per 1000 km ²	5.396	0.936	3.3258	6.401
Number of bank branches per 100,000 adults	5.1606	0.8964	3.7811	6.564
Number of ATMs per 1000 km ²	12.8433	7.451	0.584121	21.365
ATMs (per 100,000 adults)	12.171	5.391	0.6801	17.195
Depositors with commercial banks	754.203	350.066	296.167	1458.407
Regressors				
Domestic credit to private sector	12.4838	3.101	8.1204	19.626
Gross Capital Formation (GCF) (% of GDP)	20.936	5.782	14.904	33.835
Inflation, consumer prices (annual)	12.157	3.456	5.388	17.864

The descriptive analysis shows that the average credit to the private sector was 12.5%, with a standard deviation of 3.1%. The observed values ranged from a minimum of 8.1% to a maximum of 19.6%. The study findings further show that GCF ranged from a minimum 14.9% to a maximum of 33.8%. The mean value of GCF is estimated to be 20.9%, with a standard deviation of 5.8%. The inflation rate has an average value of 12.2% and a standard deviation of 3.5%. From 2004 to 2021, the minimum inflation was 5.4%, while the maximum was 17.9%.

4.1.2. Descriptive Statistics for Model 1

Table 2 shows usage and quality indicator descriptive statistics. It was revealed that 61.5% of Nigerians have a formal financial institution account, whereas 38.5% do not. In addition, 84.8% of respondents do not have a mobile account, whereas 15.2% have one. The inability to have a mobile account may be due to a need for more awareness of digital FI's benefits [74]. Additionally, 51.4% carried out digital payments, while 48.6% of the respondents did not. As shown in Table 2, 36.3% of respondents did not save last year whereas 63.7% did. Additionally, 43.7% of the respondents did not borrow in the last year, while 56.3% did. Kama and Adigun posited that Nigerians save and borrow for emergency preparedness [75]. Thus, infrastructure that makes fund withdrawal easy and fast would benefit the public. The report also stressed preventing cash shortages at ATMs and point-of-sale terminals. These measures are essential to build public trust in the financial system.

Table 2. Descriptive statistics for usage, quality variables, and control variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
ACCOUNT	.	.	.	.	.
No	1000	0.385	0.487	0	1
Yes	1000	0.615	0.487	0	1
account mob	.	.	.	.	.
No	1000	0.848	0.359	0	1
Yes	1000	0.152	0.359	0	1
Saved last year	.	.	.	.	.
No	1000	0.363	0.481	0	1
Yes	1000	0.637	0.481	0	1
Borrowed last year	.	.	.	.	.
No	1000	0.437	0.496	0	1
Yes	1000	0.563	0.496	0	1
DIGITAL	.	.	.	.	.
No	1000	0.486	0.5	0	1
Yes	1000	0.514	0.5	0	1
Emergency saving	.	.	.	.	.
no	978	0.797	0.403	0	1
yes	978	0.203	0.403	0	1
wage payment	.	.	.	.	.
no	256	0.441	0.498	0	1
yes	256	0.559	0.498	0	1
poverty	.	.	.	.	.
non-poor	1000	0.692	0.462	0	1
poor	1000	0.308	0.462	0	1
Age	999	31.542	11.813	15	94
EDU	.	.	.	.	.
primary	999	0.213	0.41	0	1
secondary	999	0.747	0.435	0	1
tertiary	999	0.04	0.196	0	1
EMP	.	.	.	.	.
unemployed	1000	0.206	0.405	0	1
employed	1000	0.794	0.405	0	1
GEN	.	.	.	.	.
male	1000	0.563	0.496	0	1
female	1000	0.437	0.496	0	1
rural	.	.	.	.	.
Urban area	1000	0.66	0.474	0	1
Rural area	1000	0.34	0.474	0	1

Furthermore, Table 2 demonstrates that, regarding the quality dimension, 97.2% of the respondents did not receive any government transfer, and only 2.8% did. Additionally, 79% of the participants had other sources of emergency funds other than savings. The 2021 Global Findex reported that 65.9% of Nigerians do not save at financial institutions; therefore, they cannot get any funds during an emergency and instead they seek funds from informal sources. The results reveal that 85.5% of the respondents are worried about their finances. This is not surprising, as the poverty level in Nigeria is increasing. Additionally, 60% of the population received wage payments, while 40% did not.

The sample population further shows that 21.3% have only completed primary school, 74.7% have completed secondary school, and only 4% have completed postsecondary education. Urban residents accounted for 66% of the respondents, and 34% are rural residents. Most respondents said they are employed (79.4%). Women make up 43.7%, and males 56.3% of the sample. Ages ranged from 15 to 94. The data also show that 69.2% of the sampled respondents are non-poor, and 30.8% are poor.

4.2. Principal Component Analysis (PCA)

Table 3 below presents the results of the PCA. Since the study's primary goal is to promote simplicity of FI, it will focus exclusively on eigenvalues larger than 1 [76].

Table 3. Principal components with cumulative variance (Eigen values).

Dimensions	Components	Eigenvalue	Proportion	Cumulative
FINACC	1	3.935	0.656	0.656
	2	1.472	0.245	0.901
	3	0.464	0.077	0.979
	4	0.124	0.021	0.999
	5	0.003	0.001	1.000
	6	0.001	0.000	1.000
FINUSE	1	1.579	0.395	0.395
	2	0.944	0.236	0.631
	3	0.803	0.201	0.832
	4	0.674	0.168	1.000
FINQUA	1	1.749	0.583	0.583
	2	0.888	0.296	0.879
	3	0.363	0.121	1.000
FI (FINUSE & FINQUA)	1	1.433	0.716	0.716
	2	0.567	0.284	1.000

Note: Data for FINACC were from the IMF Access survey, while data for FINUSE and FINQUA were from the Global Findex.

The first principal components under the FINACC dimension explain 65.6% of the total variance in FINACC, 39.5% in terms of usage (FINUSE), and 58.35% in terms of quality (FINQUA), with corresponding eigenvalues of 3.935, 1.579, and 1.749, respectively. The first components of access, usage, and quality dimensions are used in constructing the composite dimension indices based on the eigenvalue criterion.

Table 4 reveals that in COMP1, the indicator with the most extensive loading for the access dimension is ATMs (1000 sq km), weighing 0.495. The second largest loading is ATMs (100,000 adults), with 0.469. The third is depositors with commercial banks, with a weight of 0.45. The number of insurance corporations (−0.377), commercial banks (1000 sq km) (−0.114), and commercial banks (10,000 adults) (−0.418) have minus signs next to their weights, which represents a lack of sufficiency on the access dimension. In COMP2, the indicator with the highest weight is commercial banks (1000 sq km), and suggests the importance of this indicator in increasing FINACC.

Additionally, the PCA result in Table 4 reveals that three indicators occupy the highest loadings on the usage dimension in COMP1. They are ACC, MOACC, and SAVED, with weights of 0.587, 0.528, and 0.511, respectively, while BORROWED is the indicator with the lowest loadings with weights of 0.339. In addition, the study reveals that two indicators account for most of the loadings in the quality dimension. Weights of 0.672 and 0.629 are assigned to the WAGE and DIGITAL factors, respectively, while EMERGENCY has the lightest loadings of the indicator at 0.390. Table 4 also shows that in COMP1, the overall FI index (FI), both FINUSE and FINQUA, possess equal loading with a weight of 0.707. This suggests that both usage and quality dimensions contribute equally to FI.

Table 4. Principal components' estimates (Eigen vector).

Variable	Comp1	Comp2
FINACC		
Number of insurance corporations	−0.376	−0.346
Number of bank branches per 1000 km ²	−0.114	0.771
Number of bank branches per 100,000 adults	−0.418	0.457
Number of ATMs per 1000 km ²	0.494	0.117
ATMs (per 100,000 adults)	0.469	0.246
Depositors with commercial banks	0.454	−0.053
FINUSE		
ACC	0.587	−0.210
MOACC	0.528	−0.422
SAVED	0.511	0.096
BORROWED	0.339	0.877
FINQUA		
DIGITAL	0.629	−0.410
EMERGENCY	0.390	0.902
WAGE	0.672	−0.139
FINC		
FINUSE	0.707	0.707
FINQUA	0.707	−0.707

Note: Data for FINACC were from the IMF Access survey, while data for FINUSE and FINQUA were from the Global Findex. MOACC stands for Mobile Account.

4.2.1. Reliability and Validity

To assess the appropriateness of the data for the analysis, two evaluations were conducted, namely the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity [69].

Table 5 shows that the various indices have KMO values greater than 0.5; therefore, they were included in the analysis. Additionally, the *p*-value of the BTS for each dimension is 0.000, so we accepted the alternative hypothesis that the correlation matrix is not an identity matrix and reject the null hypothesis. This indicates that the variables in the correlation matrix are suitable for PCA.

Table 5. Results of Bartlett's Test of Sphericity (BTS) and KMO measure.

Dimensions	BTS			KMO Measure
	Chi-Square	Degrees of Freedom	<i>p</i> -Value	KMO Measure
Access index	155.917	15	0.0000	0.533
Usage index	214.355	6	0.0000	0.620
Quality index	142.699	3	0.0000	0.526
Inclusion index	51.684	1	0.0000	0.500

For the Bartlett's test, KMO indicates Kaiser–Meyer–Olkin Measure of Sampling Adequacy.

4.2.2. Access to Financial Services and Poverty Alleviation

The figure below illustrates the relationship between poverty rate and access to financial services, providing valuable understanding of the mechanisms by which these two factors interact. The access variable is an index generated by PCA from several access variables. By plotting financial access against the poverty rate, we aim to reveal patterns

and deviations that can inform policy and intervention measures. The scatter plot captures a wide array of data points, allowing a detailed analysis of the potential correlation between financial inclusion and the poverty rate.

Figure 1 indicates that financial access has a negative relationship with the poverty rate. This shows that as the poverty rate increases, financial access decreases. This indicates that economies like that of Nigeria with higher poverty rates tend to have less access to financial services such as loan facilities and digital banking services. This may result from inadequate infrastructure, low financial awareness levels, or structural obstacles. Consequently, the absence of access to financial services perpetuates the cycle of poverty. Additionally, the limited access to financial services may be attributed to elevated banking transaction costs and protracted waits in Nigeria. Even though the graph shows a declining trend, this does not necessarily mean that there is a causal relationship between the two variables. There could be more underlying problems, such as the quality of the regulations and the governance structure [37]. The figure also indicates that there might be substantial variations in financial access even among individuals with identical poverty levels, implying the necessity for targeted interventions rather than universally applicable policies.

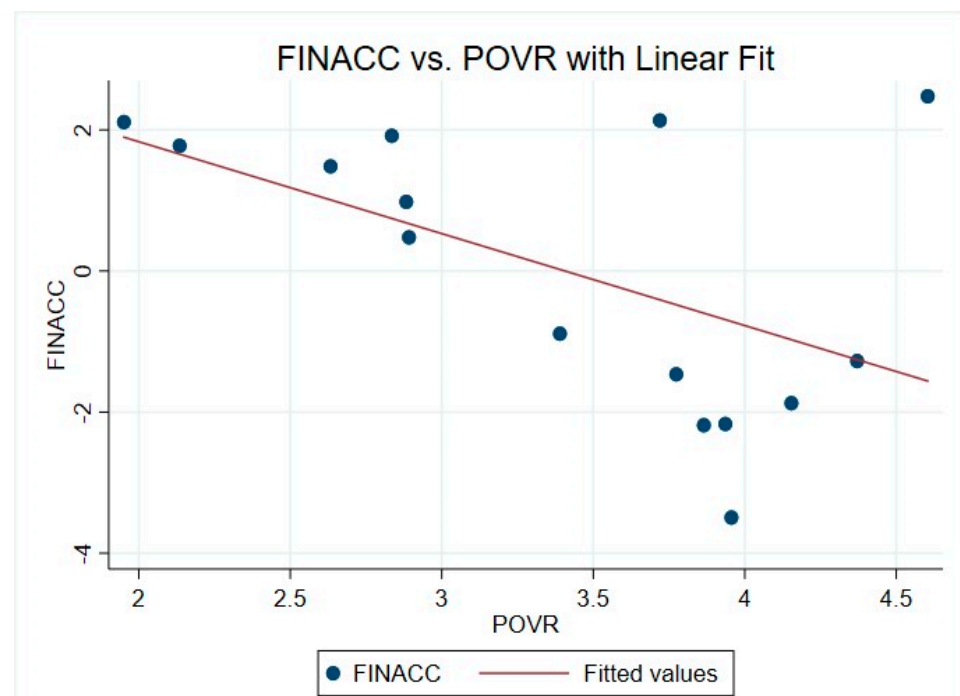


Figure 1. This figure shows the relation between financial access (FINACC) and poverty in Nigeria.

4.3. Test of Hypotheses

4.3.1. Financial Usage and Poverty Alleviation

The second hypotheses of the study supported that financial usage (FINUSE) has no significant effect on poverty alleviation in Nigeria as shown in Table 6. FINUSE also has a marginal effect of -0.051 . While controlling for other characteristics, this indicates that wealthier people are 5% more likely to use financial services. In terms of the hypothesis, the p -value (0.019) of the t -statistic is less than 0.05. Therefore, the null hypothesis of FINUSE has no significant effect on poverty alleviation in Nigeria is rejected.

Table 6. Probit marginal effects on financial usage, quality, and poverty.

	<i>Model 1</i>	<i>Model 2</i>
<i>Variables</i>	<i>Marginal Effects (1)</i>	<i>Marginal Effects (2)</i>
FINUSE	−0.0510 ** (0.019)	
FINQUA	−0.00862 (0.756)	
FI		−0.0308743 (0.254)
AGE	−0.0062187 ** (0.026)	−0.00642 ** (0.019)
EDU (base-Primary)		
Secondary	−0.3418343 ** (0.013)	−0.3621 *** (0.010)
Tertiary	−0.3225606 * (0.073)	−0.3527 *** (0.047)
EMP (base-not employed)		
Employed	−0.1742933 (0.126)	−0.1773415 (0.121)
GEN (base-male)		
Female	0.1333 ** (0.023)	0.1362 ** (0.022)
RURAL (base urban)		
Rural	0.0367835 (0.520)	0.054464 (0.356)

Prob values are in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.3.2. Quality of Financial Services and Poverty Alleviation

The third study hypothesis supports that the quality of financial services has no significant effect on poverty alleviation. As shown in Table 6, the coefficient of FINQUA is negative; however, there is no statistically significant association between being poor and financial quality.

4.3.3. Financial Inclusion and Poverty Alleviation

Furthermore, FI has a negative coefficient indicating an inverse relationship between FI and POOR. However, there is no statistically significant relationship between financial inclusion and poverty. Based on the regressors, the secondary and higher education coefficient were negative and statistically significant at 5% in Models 2 and 3. In Model 2, the marginal effect of secondary education is −0.342, while the marginal effect of tertiary education is −0.322. In Model 3, the marginal effect of secondary education is −0.362, while the marginal effect of tertiary education is −0.352. This suggests that a respondent with secondary and higher education, compared to those with primary education, lowered the probability of being poor by 0.342 and 0.322, respectively, in Model 2. This implies that individuals with secondary and higher education are less likely to be poor compared to those with primary education.

Furthermore, in terms of gender, the female coefficient is positive and statistically significant at a 5% level both in Models 2 and 3, respectively. The marginal effect is 0.133 in Model 2 and 0.136 in Model 3. This indicates that the probability of being poor was 0.133 points higher for the females than their male counterparts in Model 2 and 0.136 points higher in Model 3, holding other factors constant. The results in Table 6 also showed that

the age coefficient was negative and significant at a 5% level. An additional age of one year decreases the likelihood of being poor both in Model 2 and Model 3. This implies that as Nigerians age, they are less likely to be poor.

5. Discussion

The study investigated the relationship between financial inclusion and poverty alleviation in Nigeria using both micro and macro data and evaluating separately the three financial dimensions, i.e., access, usage, and quality.

The study's findings revealed that financial access has a negative relationship with poverty as shown in Figure 1. As such, poverty reduces as access to financial services increases. Despite the contradictory outcomes the existing literature offers [30,32], our study confirms the finance-led growth theory [51], governing that accessible and affordable financial resources are necessary to accelerate progress and reduce poverty as access to financial services alleviates poverty [25,28,52]. Both Schumpeter's (1934) finance theory and the trickle-down theory argued that the dynamic economy emerged by investments made in the private sector generates jobs, lowers the unemployment rate, and increases earnings [51]. As such, poverty may be alleviated as people, even those who experience poverty, have more money to invest [46]. A lack of financial access may cause delays in capital accumulation, economic progress, and living standards. Furthermore, a significant and positive relationship exists between inflation and poverty. Correspondingly, Agwu and Neaime and Gaysset concluded that increased inflation erodes people of their ability to spend, thus reducing their standard of living [59,77]. According to neoclassical theory, government policies that do not focus on capital investment and fail to distribute wealth equally are responsible for the economy's inadequacies and instability, which are observed in their countries [39].

The study revealed that the usage of financial services has a negative and significant association with poverty, indicating that poverty will decrease as the usage of financial services increases. Such outcomes are in alignment to previous research that supports the long-term effect of the usage of financial service on poverty alleviation [32,52]. Nevertheless, scholarly research in this field has different outcomes to support. For instance, Adeleke and Olomola found that using financial products may increase poverty in the short term [30].

Our study findings indicate, further, that the quality of financial services relates negatively to poverty. Such negative relationship implies that individuals may get emergency funding or government support when they cannot meet their financial needs; thus, their poverty level reduces [37]. However, the quality of the financial services has not yet reduced poverty in Nigeria significantly. Both Kama and Adigun and Ozili (2020) argued that financial inclusion efforts face a major obstacle due to the embezzlement of funding by dishonest politicians in Nigeria [75,78]. They divert funds initially assigned to financial inclusion projects to other, possibly self-gratifying ones. As a result, government organisations that are in charge of carrying out and meeting particular financial inclusion targets may approve insufficient resources to fulfil them. The restriction of resources during the phase of their allocation significantly minimises the capacity of organisations to efficiently promote financial inclusiveness. Therefore, as long as there is a chance of misappropriation, the goals of financial inclusion projects might not materialise.

In the case of our study, financial inclusion has negatively affected poverty, yet such relationships are insignificant. Although, the study outcomes revealed that an increase to financial inclusion is followed by poverty reduction, the insignificant relationship between the two variables can be explained by a low level of financial literacy and unawareness of digital financial inclusion, which are both observed in Nigeria [40]. The existing literature also supports the notion that financial inclusion leads to an improved standard of living and aligns with the trickle-down theory governing that financial inclusion may reduce poverty [33,56], yet such relationship must be mediated by the activities undertaken of the financial institutions. As already discussed above, the existing literature also presents an

opposite effect of financial inclusion on poverty, namely, that financial inclusion cannot decrease the levels of poverty [57–59].

The study findings further demonstrate numerous factors contributing to poverty in Nigeria. Specifically, the individual's level of schooling influences the likelihood of experiencing poverty. In that, secondary and tertiary education correlate both negatively and significantly to poverty. Those with a secondary and higher level of education are less likely to live in poverty than those with primary education [53]. In this vein, it can be supported that individuals with higher levels of education may reduce their likelihood of experiencing poverty. According to EFINA [17], adults in Nigeria with higher levels of education have a much greater chance of being financially included.

Additionally, age negatively and significantly correlates to financial inclusion, meaning that younger people may be more likely to experience poverty than older people. As EFINA reported [17], 47% of Nigerian 18-to-25-year-olds were financially excluded. Young folks, particularly those under 25 years of age, have higher unemployment rates and face more difficulty in finding jobs [79]. Due to the high number of unemployed young people, banks limit access to their services [79]. Moreover, females are more likely to experience poverty in Nigeria than their male counterparts. Nigerian women are less likely than men to have bank accounts and disproportionately responsible for household spending (Efobi et al., 2014) [17,80]. In this vein, Demirgüç-Kunt et al. suggested that gender-based legal discrimination and sociocultural gender norms may explain the gender gap in financial resources [6].

Regarding the rural variable, the study supports that individuals residing in rural areas are likely to be poor compared to those in urban areas. In 2020, 81% of Nigeria's excluded adults resided in rural areas [17]. Similarly, Mahalika also found that poor Africans live in rural areas [62]. Rural areas have a greater poverty rate than urban areas due to the difficulty of providing inexpensive and sustainable financial services to those areas [81,82].

5.1. Implications for Theory

The research provides evidence for the trickle-down theory, which posits that macro-level economic policies should have a direct impact on individual financial well-being by trickling down from the higher levels of the economy to the lower levels [44]. The inverse relationship between financial access and poverty demonstrates how macro-level activities such as increased financial access may trickle down to enhance financial inclusion at the microlevel, hence alleviating poverty. Moreover, the negative relationship between financial usage and poverty implies that when individuals use financial services, they can better manage their resources and improve their economic wellbeing [48,49]. This highlights the tenet of neoclassical economics, which holds that poverty may be reduced through effective markets and well-informed decision-making. Conversely, it is crucial to acknowledge that the demand for these services may also be intrinsically low among the poor. The problem encompasses not just the available supply, but also the desired demand. Structural obstacles, like poor and irregular incomes, inadequate financial literacy, and urgent immediate demands, could make formal financial services less appealing or useful [49]. Nevertheless, the study generally aligns with the neoclassical theory, the finance-led growth theory and the importance of secure, accessible, and affordable financial services to accelerate progress and reduce income disparity and poverty.

5.2. Implications for Practice

This research provides practical implications for policy makers and financial institutions. The research revealed a significant negative relationship between financial access and poverty, suggesting that improving access to financial services could lead to a decrease in the level of poverty [25]. This result suggests that financial institutions should broaden their reach and presence, in line with policy efforts targeted at promoting financial inclusion as a strategy for poverty reduction. Additionally, it is apparent from the results that financial products could have a significant negative impact on poverty. Thus, financial literacy and

education programmes for Nigerians, could help them understand and effectively use financial services. Various demographic groups, such as rural communities, youth, and women are likely to benefit from these programmes [10].

The findings further buttress the notion that mere access to and usage of financial products is insufficient to classify individuals as financially included. The subsequent quality of these services must also increase [37]. As a result, for the benefits of an inclusive system to trickle down to all members of society, financial institutions should prioritise providing high-quality financial products and services that are affordable to all. These findings serve as a catalyst for countries to undertake financial inclusion initiatives and gain a better understanding of the dimensions of financial inclusion to prioritise their efforts effectively. This will result in enhanced economic growth and improvement in financial wellbeing [4,78]. However, the implementation of such policies is likely to be expensive and might require limited resources to be shifted from other important services. Therefore, the implementation of such policies could be challenging for the policymakers. Moreover, access to financial services alone would not lead to poverty alleviation.

5.3. Limitations and Implications for Future Research

The relationship between financial access (supply side) and poverty was evaluated using IMF access data from 2004 to 2021. This study span was chosen due to the data availability on the selected variables. Financial usage and quality (demand side) of poverty in Nigeria were evaluated using probit regression. Data were collected from the 2021 Global Findex database. In addition, overall, the financial inclusion index was analysed using probit regression with data from the 2021 Global Findex.

Previous studies conducted in Nigeria have primarily focused on examining only one or two dimensions of financial inclusion. The study reviewed financial inclusion access, usage, and quality aspects by utilising a comprehensive dataset from the global index for the usage and quality dimensions and the IMF Access database for the access dimension. That is, covering both macro and micro data. As a result, this research stands out as one of the most comprehensive studies on the relationship between financial inclusion and poverty in Nigeria. However, in the process of constructing indices using PCA, specific indicators were excluded. For example, the access index did not include the number of borrowers or outstanding debts. The usage of credit cards was not included in the usage index, whereas government remittances and transfers were not in the quality index.

Furthermore, the study employs the most recent survey data, covering 1000 Nigerian households in 2021. This is one of the most current studies using this survey's most recent wave of data. Survey methods and levels of complexity are constantly evolving, which gives us a substantial edge in data quality and sample size. However, the study's results are predicated on a limited sample size, as it solely evaluates financial inclusion and poverty in Nigeria. Consequently, the generalisability of the findings to other nations is challenging, except when the indicators for measuring and parameters employed in the study are comparable.

6. Conclusions

From the results, it is apparent that the one of the main dimensions of financial inclusion, namely, financial usage could act as a catalyst for poverty alleviation. The results could imply that Nigerian government's financial inclusion policies (e.g., implementing digital methods for disbursing financial aid during emergency periods, such as COVID-19 outbreak; and extending credit to the private sector) could help to mitigate the recent upsurge in poverty levels.

By bringing such outcomes in line with the neoclassical economic theory, predicting that poor people have less disposable income and fewer savings accounts due to discrimination [83], we hope that financial inclusion will not be approached as a standalone objective. Rather, it should be approached as a strategic tool to alleviate poverty in both immediate and long-term contexts with applicability around the globe.

Author Contributions: Conceptualization, C.M.O., S.B., E.K., D.V., E.S. and I.K.; Methodology, C.M.O., S.B., E.K., D.V., E.S. and I.K.; Formal analysis, C.M.O., S.B., E.K., D.V., E.S. and I.K.; Resources, C.M.O., S.B., E.K., D.V., E.S. and I.K.; Data curation, C.M.O.; Writing—original draft, C.M.O., S.B., E.K., D.V., E.S. and I.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data are contained within the article.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Summary of Variables for Access Indicators and Control Regressors

	Access Indicators	Definition	Source of Data
POVR	Poverty rate	Log poverty headcount ratio, defined as the percentage of the population living on less than USD 1.9 per day at 2011 international prices; was used to calculate poverty rates in the study.	
	Number of automated teller machines (ATMs) per 100,000 adults	This metric represents the number of ATMs per 100,000 adult individuals in Nigeria	IMF Financial Access Surveys
FINACC	ATMs per 1000 km ² (Atm km ²)	This variable identifies the number of ATMs in Nigeria per 1000 square kilometres.	IMF Financial Access Surveys
	Number of commercial bank branches per 100,000 adults	This metric represents the number of commercial banks and their respective branches per 100,000 adult individuals in Nigeria.	IMF Financial Access Surveys
	Commercial bank branches per 1000 km ² (Branch km ²)	This variable identifies the number of commercial bank branches in Nigeria per 1000 square kilometres.	IMF Financial Access Surveys
	Depositors with commercial banks (per 1000 adults)	This variable represents the number of depositors with commercial banks per 100,000 adult individuals in Nigeria.	IMF Financial Access Surveys
Control Regressors			
CRS	Credit to private sector (% of GDP)	Domestic credit to private sector pertains to the monetary funds extended to the private sector by financial institutions, which may include loans, non-equity securities purchases, trade credits, and other accounts receivable that create an obligation for reimbursement (World Bank, 2022) [84]. CRS is expected to have a negative coefficient.	World Development Indicators
INFL	Inflation rate (Consumer price index)	The term “inflation” refers to the alteration in wholesale prices on a yearly basis. According to [85], the poor are more sensitive to the negative consequences of regular, large price swings since they keep more cash in smaller investments and have less access to inflation hedging tools. Thus, the model’s INFL coefficient will be positive.	World Development Indicators
GCF	Gross Capital Formation (% of GDP)	Expenditures on the creation of new fixed assets and the net change in inventory are the two components that make up an economy’s gross capital formation [84]. This variable is expected to have a negative coefficient.	World Development Indicators

Note: Data for FINACC and other variables were from IMF Access survey (Macrodata).

Appendix B. Usage, Quality and Overall Inclusion Index Indicators of FI and Control Variables

Indicators	Variables Description	Coding	Source
POOR	This is the income quintile of the household. This variable is made up of five quintiles (poor, second, middle, fourth richest). It is further divided into two groups. "Poor" includes poor and second, while "non-poor" include middle, fourth and richest. This is based on WDI 40% and 60% income grouping.	The outcome variable is a binary variable denoted as "poor", where a value of 1 was assigned to individuals "within economy income quintile" who fell within the lowest 40% of the distribution, and 0 was assigned otherwise [22,39].	Global Findex Survey (2021)
Financial Usage (FINUSE)			
ACCT	Number of adults who report having an account at a financial institution	ACCT is coded 1 if the adult has an account at a financial institution and 0 otherwise	Global Findex Survey (2021)
MOACC	Percentage of adults who report having a mobile account	MOACC is coded 1 if the adult reported having a bank account and 0 otherwise	Global Findex Survey (2021)
SAVED	Percentage of adults who saved in the past year.	SAVED is coded 1 if the saved in the past year and 0 otherwise	Global Findex Survey (2021)
BORROWED	Percentage of adults who borrowed in the past year.	BORROWED is coded 1 if the saved in the past year and 0 otherwise	Global Findex Survey (2021)
Product Quality (FINQUA)			
EMERGENCY	Adults whose main source of emergency funds in 30 days was their saving	EMERGENCY is coded 1 if the adult reported using saving as emergency fund and 0 otherwise.	Global Findex Survey (2021)
DIGITAL	Adults who made or received a digital payment.	It will be coded 1 if the adult made or received a digital payment and 0 otherwise.	Global Findex Survey (2021)
WAGE	Number of adults who received wage payments into an account	It will be coded 1 if adult received wage payments into an account and 0 otherwise.	Global Findex Survey (2021)
Control Variables			
EDU	Educational level of the respondent	EDU is coded as: No education (0), primary (1) Secondary (2), and tertiary (3).	Global Findex Survey (2021)
EMP	Employment status of the respondent	EMP is coded 1 if the adult is in the workforce and 0 otherwise	Global Findex Survey (2021)
RURAL	Where the respondent lives	RURA is coded 1 if the adult lives in rural area and 0 otherwise	Global Findex Survey (2021)
AGE	Age of individual respondent	This is a continuous variable	Global Findex Survey (2021)
GEN	Gender of the respondent	GEN is coded 1 if the adult is in the male and 0 female	Global Findex Survey (2021)

Note: Data for FINUSE, FINQUA and FI were from the 2021 Global findex (microdata).

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