

## What Can We Infer from Financial Inclusion and Income Inequality Using Nigeria Data?

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### Abstract

This study examines the relationship between financial inclusion and income inequality in Nigeria from 1985 to 2022. The ARDL (Autoregressive Distributed Lag) and Granger causality tests were used with data from the central bank statistical bulletin and the World Bank. The results revealed a significant and negative relationship between financial inclusion and income inequality, suggesting that increased access to financial services contributes to a reduction in income disparities in both the short and long run. Human capital variables, such as education expenditure (NE) and employment levels (UNEMP), also play crucial roles in reducing inequality, highlighting the importance of investing in education and job creation to complement financial inclusion efforts. Public health expenditure (HLTEXP) and economic growth were found to contribute to the reduction of inequality; inflation worsens it, particularly affecting low-income households. The Granger causality test indicates that financial inclusion, especially through the expansion of commercial bank branches, significantly influences income inequality, affirming the importance of financial inclusion in mitigating income inequality. The study concludes that financial inclusion, coupled with supportive investments in education, employment, health, and macroeconomic stability, can significantly reduce income inequality in Nigeria. We recommend that access to financial services be expanded and enhanced human capital development to ensure inclusive and sustainable economic growth.

**Keywords:** Financial inclusion, Income inequality, ARDL, Granger causality, Nigeria, Inclusive growth

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## 1. Introduction

Financial inclusion and economic inequality are pivotal issues influencing the socio-economic development of Nigeria. Financial inclusion, according to Demirguc-Kunt, Klapper, Singer, Ansar, and Hess (2018), refers to the accessibility and usage of affordable financial services by various segments of the population, particularly the underserved. Economic inequality denotes the uneven distribution of income and wealth across the populace (Piketty, 2014). Despite efforts to promote financial inclusion, challenges remain in ensuring equitable access to financial services across different segments of the population. Furthermore, the relationship between income inequality and financial inclusion is becoming increasingly apparent; more empirical studies are required to examine its importance of fostering economic development.

Financial inclusion is a key element of social inclusion, particularly useful in combating poverty and income inequality by opening blocked advancement opportunities for disadvantaged segments of the population. Inclusive financial systems ensure that credit is allocated more efficiently and equitably. When financial institutions provide credit to a broader segment of the population, it enables more people to undertake productive investments, leading to economic growth that benefits a wider range of individuals. Improved credit allocation helps reduce barriers to entrepreneurship and innovation, allowing individuals from diverse backgrounds to participate in economic activities and improve their income levels.

In Nigeria, despite various initiatives aimed at increasing financial inclusion, such as the National Financial Inclusion Strategy, a substantial portion of the population remains unbanked or underbanked. According to the World Bank, only 39% of Nigerian adults had access to formal financial services in 2018. However, a survey report from Enhancing Financial Innovation and Access (EFInA) on access to finance (A2F, 2003) revealed that financial inclusion in Nigeria has grown significantly from 56% in 2020 to 64% in 2023. However, Nigeria has not reached its recommended target of 25% as this limited access to financial services significantly hampers economic opportunities for many Nigerians, particularly those in rural areas and among the poor.

Inequality, however, manifests in various dimensions, including income, wealth, and access to goods and services. Nigeria has one of the highest levels of income inequality in the world, with a Gini coefficient of 35.1 by 2022. This high level of inequality is not just an economic issue but also a social and political one, as it can lead to increased social tensions and hinder sustainable development. Research suggests that financial inclusion can reduce inequality by providing marginalized populations with access to financial services, thereby improving their economic opportunities and resilience to shocks. Demirgüç-Kunt, et al (2018). The positive impact of financial inclusion on income inequality has been documented in several regions, although the extent of the impact varies depending on local conditions (Demirgüç-Kunt et al., 2018; Sahay, Sosenko, and Sugawara, 2015).

Globally, financial inclusion is recognized as a critical enabler for reducing poverty and boosting shared prosperity. The World Bank and the United Nations emphasize the role of financial inclusion in achieving Sustainable Development (World Bank, 2018; United Nations, 2020). Despite this progress, significant regional and demographic disparities remain, with rural areas and women being particularly underserved. According to the United Nations 2030 Agenda for Sustainable Development, financial inclusion has a crucial role to play in achieving sustainable development goals, in this case, reducing inequalities.

Despite the efforts to promote financial inclusion, Nigeria faces substantial challenges. According to the Global Findex Database 2021, approximately 55% of Nigerian adults remain unbanked, indicating a high level of financial exclusion. Factors contributing to this exclusion include limited access to financial institutions, low levels of financial literacy, and socio-economic barriers such as poverty and gender inequality. Several studies have identified barriers to financial inclusion in Nigeria, including but not limited to inadequate financial literacy, limited infrastructure, cultural factors, and regulatory issues. Addressing these barriers is essential for enhancing the impact of financial inclusion on economic inequality. Central Bank of Nigeria (2019); World Bank (2019).

This research is motivated by the need to understand the relationship between financial inclusion and inequality. Specifically, it seeks to answer several key questions: How does financial inclusion impact income inequality in Nigeria? Can increased financial inclusion reduce inequality, and if so, through what mechanisms? Addressing these questions is crucial not only for academic understanding but also for informed policy direction. The rest of the paper is structured as follows: Section 2 focuses on the review of literature, while Section 3 discusses the methodology, and Section 4 provides the results and discussion. Finally, Section 5 concludes the study and makes some recommendations.

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## 2. Literature Review

### 2.1 Theoretical review

In this section, we analyze various works on financial Inclusion and inequality in which our model specification was derived to estimate the impact of financial development on inequality in Nigeria.

#### Studies on Financial inclusion and inequality

Research on the relationship between financial inclusion and inequality examined in this study are based on the work of Galor and Zeira (1993), Greenwood and Jovanovic (1990), and Beck, Demirgüç-Kunt, and Levine (2007).

Oded Galor and Joseph Zeira's 1993 paper, "Income Distribution and Macroeconomics," presents a theoretical framework that explores the interplay between financial inclusion, income distribution, and economic growth. Their model focuses on the effects of financial market imperfections on human capital investment and the resulting long-term income inequality. According to the Galor-Zeira model, imperfections in the financial market prevent poor people from escaping poverty by restricting their access to formal financial products and services. In their model, Galor and Zeira demonstrated that imperfect credit markets restrict the access of poor people to financial services. Due to the fact that increased financial inclusion is associated with lower levels of income inequality, as pointed out by (Aslan, Deléchat, Newiak, and Yang, 2017; Park and Mercado, 2018; Turgeon and Herrero, 2018).

There are various theoretical literature on the relationship between finance and inequality; however, few classical economists, including Kuznets, argued that income inequality could boost capital accumulation and growth by directing resources toward agents with a high saving propensity (Kuznets, 1955; Lewis, 1954; and Kaldor, 1955). According to various theoretical models, financial development can reduce inequality through a variety of channels. Poor people are unable to invest in their own education and, as a result, cannot find better-paying jobs. Inequality can be lessened if people with low incomes can afford to put money into their education Galor and Zeira, (1993); Galor and Moav, (2004); Aghion and Bolton, (1997). Another channel focuses on the poor's ability to start their own businesses.

Financial development may lower collateral requirements and borrowing costs, thereby encouraging new business ventures

and the establishment of new firms (Banerjee and Newman, 1993). High-productivity projects, according to Matsuyama (2000), come with a hefty upfront investment. It is only the wealthy who can afford these costs because of a lack of credit. In Buera (2009), entrepreneurship is hindered by financial frictions, so wealthy agents can start businesses while the poor are confined to salaried positions. Increased demand for labor by firms may also alter the distribution of income rather than an increase in the poor's access to credit. Beck et al., (2010). Low-income workers may benefit from the increased demand for labor.

In contrast, some authors have disagreed with scholars like Galor and Zeira, who theorized that financial development and inclusion are expected to close the income inequality gap. Some argue that the poor primarily rely on informal connections (e.g., family) to obtain money, and that the development of formal financial services specifically benefits the wealthy. Claessens and Perotti, (2007). In some theoretical models, the relationship between financial development and the opportunities for the poor may not be linear and may depend on the degree of economic development. An inverted U-shaped relationship between financial and economic development is shown by Greenwood and Jovanovic (1990), which is similar to Kuznets' hypothesis that growth may lead to an increase in income inequality in the early stages of development and a decrease in it later on.

According to Greenwood and Jovanovic (1990), they highlighted the importance of financial markets in human capital investment. Access to finance allows poorer individuals to invest in education, leading to reduced income inequality in the long term. Also, financial intermediaries provide information on projects, but participating in their services has a fixed cost. Because only the wealthy can afford to bear this one-time expense in the early stages of development, economic progress tends to widen existing disparities. As the economy grows, the financial system becomes more accessible to the poor. Non-linearities in the financial development-inequality nexus have been highlighted by Greenwood and Smith (1997) and Townsend and Ueda (2006), who argue that the development of sophisticated financial institutions may entail large fixed costs (Bourguignon, 2001). Finance and equality may have different associations in different countries because of factors like the regulatory environment and quality of institutions, economic development, the nature of financial markets, and policies for financial inclusion in place, even though there are conflicting theoretical explanations for the link between finance and equality.

Another study on financial inclusion was developed by Beck, Demirgüç-Kunt, and Levine (2007). They explored the relationship between financial development, financial inclusion, and income inequality. Their research focused on how financial systems that provide more inclusive access to financial services can impact income distribution and economic opportunities. They postulated that financial development reduces income inequality by providing broader access to financial services. This inclusion allows lower-income individuals to save, invest, and insure against risks, which in turn enhances their economic opportunities and welfare. The theory suggests that financial development impacts inequality through various channels, such as Access to credit, as Lower barriers to credit can enable poorer individuals and small enterprises to undertake investments that they could not otherwise afford. Also, access to financial services allows individuals to better manage risks, smooth consumption, and invest in human capital. The authors argue that greater access to financial services, such as savings accounts, credit, insurance, and payment systems, can help reduce income inequality.

Financial inclusion allows more individuals, particularly those from low-income groups, to invest in education, start and expand businesses, and manage risks more effectively. Beck, Demirguc-Kunt, and Levine use empirical data to support their theory; they analyze cross-country data to demonstrate that countries with more developed and inclusive financial systems tend to have lower levels of income inequality. Their findings suggest that financial development that promotes broad-based access to financial services is associated with more equitable income distribution. Finally, Financial development stimulates overall economic growth, which can reduce poverty and inequality if the growth is inclusive.

## 2.2 Empirical review

Beauclair, Constant, Serge, and Elie (2023) analyzed the effect of financial inclusion on income inequalities in sub-Saharan African countries, taking into account cultural particularities. The data covered the period from 2002 to 2015 and was analyzed with the use of the dynamic panel method, generalized method of moments (GMM). The sample was made up of 27 countries of sub-Saharan Africa grouped into 4 subgroups: countries with predominantly Christian obedience, countries with obedience dominated by Islam, countries with French as the official language, and countries with English as the official language. The result showed that financial inclusion contributes to reducing income inequality in all the SSA countries considered, and also in the Christian-dominated and French-speaking countries. They found no effect of financial inclusion in Islamic-dominated and English-speaking countries. Similarly, there was evidence of an inverted U-shaped relationship in all the Sub-Saharan African countries considered and in Christian-dominated countries only. The results suggested that the socio-cultural aspect has an influence on the relationship between financial inclusion and income inequality, and another aspect of financial inclusion may be essential to reduce income inequality in SSA countries.

The Autoregressive Distributed Lag (ARDL) methodology was used on selected variables from 1981 to 2021 by Orekoya and Akintunde. (2023) they investigated the impact of income inequality in Nigeria via three financial variables: depth, access, and stability. The study found that in the short run, financial stability shows a negative impact, which was not statistically significant, on inequality, while financial depth has a statistically significant (10%) positive effect. Also, the standard of living has a statistically significant (1%) negative impact on inequality, while economic growth revealed a statistically significant (1%) positive effect. However, in the long run, financial stability showed a positive and insignificant

effect on inequality, whereas both financial access and economic growth have a positive and significant effect. Also, while financial depth has negative and insignificant effects on inequality, the standard of living has a negative but significant effect. The study recommended that financial inclusion should focus mainly on the financially excluded while the government should create incentives for private financial institutions to extend their services and activities towards the rural dwellers and those who are likely to benefit more from their services.

Okowa, Vincent, and Moses (2022) examined the "Financial Inclusion-Income Inequality" nexus in Nigeria. The paper specified income inequality in Nigeria as a function of deposit money banks' loans to SMEs, banks' credit to the private sector, number of bank branches, and broad money supply-to-GDP ratio. The data used in the study were annual time series data from 1992 to 2018, and the Dynamic Ordinary Least Squares (DOLS) econometric technique was employed. The result showed that the coefficients of financial access variables are significantly different from zero. That is, the improvement in the financial access component of financial inclusion will prove to be more effective in reducing the income inequality gap in Nigeria. The paper recommended that policy that increases awareness among citizens on the importance of owning and maintaining a bank account, and the establishment of more branches in rural areas to serve the high and growing rural population.

In a related analysis, Anthanasius and Meshach (2017) analyzed the relationship between various aspects of financial inclusion and income inequality in sub-Saharan Africa using the World Bank Global Findex 2011 with the intention to determine which aspects of inclusion have the greatest effect on income inequality. The result showed that account use for business, electronic payments, and formal savings has a positive relationship with income inequality. This possibly reflected the colonial institutional design, as Obeng-Odoom (2016) indicated that colonial administration left behind an uneven development structure, which in some cases is reinforced by current urban governance practices and processes. These colonial institutions significantly define financial sector development and shape the distribution of economic opportunities. Thus, it was argued that though account ownership has improved, it does not necessarily imply an increase in credit accessibility. This is because of problems of information asymmetry associated with the lack of financial infrastructure in the region, which encourages banks to hold excess liquidity and thus grant fewer loans. The study recommended genuine efforts to engage in democratic governance to improve the quality and functioning of institutions to support financial sector development. Furthermore, a holistic approach to development that involves both top-down and bottom-up was recommended to encourage participation by all sectors of the economy.

In the same vein, Bosede, Solomon, Ifeoluwa, and Edamisan (2021) undertook a structural break analysis on the effects of financial deepening on income inequality in Nigeria using annual data from 1980 to 2015 and an error correction approach within the framework of the autoregressive distributed lags (ARDL) model. Major findings were as follows: (1) in the long-run, financial deepening and per capita income have equalizing impact on income inequality; (2) an equalizing effect of financial deepening is observed at the turn of a break point; (3) surprisingly, in the short-run, financial deepening aggravates inequality, and (4) the equalizing effects of these variables are robust to the choice of financial deepening variables, the different structural break points and model specifications. The results suggested that income inequality depends on financial deepening and per capita income and that not controlling for structural breaks may lead to wrong inferences when making decisions on issues related to reducing income inequality in Nigeria.

Using the Generalized Method of Moments (sys-GMM) technique, Menyelim, Babajide, Omankhanlen, and Ehikioya (2021) evaluated the relevance of inclusive financial access in moderating the effect of income inequality on economic growth in 48 countries in Sub-Saharan Africa (SSA) for the period 1995 to 2017. The findings showed that inclusive financial access contributes to reducing inequality in the short run, contrary to the Kuznets curve. The result revealed a negative effect of financial access on the relationship between income inequality and economic growth. There was a positive net effect of inclusive financial access in moderating the impact of income inequality on economic growth. The study recommended the need to design policies and programmes that would enhance access to financial services as an essential mechanism to reduce income disparity and enhance sustainable economic growth.

Also, Ujah and Amaefule (2016) analyzed the impact of financial development on economic inequality in Nigeria using regression techniques on financial development indicators and inequality measures. The result showed that financial development has a mixed impact on inequality in Nigeria. They recommended that financial policies that target inclusive growth should be designed.

### 3. Methodology

#### 3.1 Model Specification

The study relies on financial inclusion theory as postulated by Beck, Demirgüç-Kunt, and Levine (2007), which posits that access to financial services enables individuals to invest in education, start businesses, and save for future needs, which can reduce income inequality. Their empirical analysis uses panel data from a wide range of countries to show that financial development, measured by private credit and bank branch density, is associated with lower income inequality. However, following some modification this study used the Gini coefficient which is commonly used as a measure of income distribution, with lower values indicating more equitable distribution of income as dependent variable and other factors such as financial inclusion (NBBC), education (NE), health expenditure (HLTEXP), unemployment (UNEMP), economic

growth (GDPRATE), urbanization (URBRATE), and inflation (INF) influence inequality are used as independent variables.

### 3.2 Objective

To empirically examine the impact of financial inclusion on income inequality in Nigeria. Following the above theoretical framework, the model was specified as follows:

$$Ginit = \alpha + \beta_1 FinInclusion_t + \beta_2 \sum_{i=1}^k \gamma_i ControlVarit + \epsilon_t \dots\dots\dots 1$$

Which is explicitly represented as follows;

$$Ginit = \alpha + \beta_1 NBBC_t + \beta_2 NE_t + \beta_3 HLTEXP_t + \beta_4 UNEMP_t + \beta_5 GDPRATE_t + \beta_6 URBRATE_t + \beta_7 INF_t + \epsilon_t \dots\dots\dots 2$$

Where:

- Gini = (Gini coefficient) at time t (%)
- NBBC = Commercial bank branches (per 100,000 adults) (%)
- NE = Primary school enrollment at time t (%)
- HLTEXP = Current health expenditure (% of GDP) at time t (%)
- UNEMP = Unemployment rate at time t (%)
- GDPGR = GDP growth rate at time t (%)
- URBRATE = Urbanization rate at time t (%)
- INF = Inflation rate at time t (%)
- $\epsilon_t$  = Error term

This specification suggests that the inequality proxy by Gini coefficient is a function of the commercial bank branches, primary school enrollment, health expenditure, growth rate of gross domestic product, urbanization rate, and Inflation rate.

## 4 Results Presentation and Discussion

In this section, the results of the regression analysis are presented, followed by a detailed discussion on the implications of the findings based on the estimated model for the period 1985-2022. The ARDL technique was used for the analysis

### 4.1 Unit root test

The Augmented Dickey Fuller test was conducted which explains the results disclosed on Table 1. It can be observed that series were integrated of mix results i.e. unit root test results are of mix order of integration such as I(0) and I(1). For example, GINI coefficient, health expenditure. Growth rate of GDP and urbanization rate are integrated of order zero I(0), while commercial bank branches, school enrollment, unemployment rate and inflation rate are integrated of order one I(1). Consequently, the mix in the order of co-integration necessitates the need for bound co-integration technique as suggested by Pesaran, Shin and Smith (2001).

Table 1: ADF Unit Root Tests

Variables	Levels	First Difference	Order of Integration
GINI	-4.302221		I (0)
NBBC		-4.221632	I (1)
NE		-6.036230	I (1)
HLTEXP	-3.701878		I (0)
UNEMP		-4.261693	I (1)
GDPGR	-4.041934		I (0)
URBRATE	-6.468988		I (0)
INF		-4.439059	I (1)

Source: Authors' computation using (EViews 12)

The Augmented Dickey Fuller (ADF) unit test results show mixed stationarity among the variables. Gini coefficient, health expenditure, growth rate of GDP and urbanization rate were stationary at levels while commercial bank branches, primary school enrollment, unemployment and inflation was stationary at first differences.

### 4.2 Model Estimation

Following the unit root which shows all variables are stationary at first different and levels, there is an econometric justification to apply the ARDL estimation technique. As such, the ARDL bond test and coefficient estimation was used for each of the specified model and the result is presented as follows;

Table 2: ARDL Bond Test Result

Model	F Statistics	5% Critical value		Decision
Equation	10.58	I(0)	I(1)	Co- integration
		2.59	3.90	

Source: Authors' computation using (EViews 12)

The ARDL bounds test is based on the assumption that the variables are I (0) or I (1) as shown above in the unit root table. The results of the ARDL bounds testing approach are presented in table (2) indicating that the computed F-statistics for explanatory variables was (10.58). The f-bound test statistics of (10.58) exceeds upper critical bound (3.90) at 5% level of significance. This finding supports that co-integrating relationship exists and confirms the stable long-run relationship between the variables. This implies that the null hypothesis of no co-integration among the variables is rejected.

Table 3: ARDL Error Correction (ECM) Regression

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GINI(-1))	1.857710	0.023106	80.39835	0.0000
D(GINI(-2))	-0.970193	0.023167	-41.87755	0.0000
D(NCBB)	-0.108198	0.027079	-3.995697	0.0015
D(NCBB(-1))	0.146885	0.026654	5.510733	0.0001
D(NE)	0.002476	0.002007	1.233253	0.2393
D(NE(-1))	0.016274	0.001940	8.390447	0.0000
D(HLTEXP)	-0.000473	0.017547	-0.026967	0.9789
D(HLTEXP(-1))	0.109318	0.018967	5.763686	0.0001
D(UNEMP)	-0.386704	0.066495	-5.815512	0.0001
D(UNEMP(-1))	-0.236988	0.059369	-3.991751	0.0015
D(GDPGR)	-0.007147	0.002409	-2.967182	0.0109
D(INF)	-0.001955	0.000637	-3.067741	0.0090
D(INF(-1))	0.002662	0.000565	4.711076	0.0004
CointEq(-1)*	-0.024739	0.001994	-12.40806	0.0000
S.E. of regression	0.058096	Akaike info criterion		-2.586694
Sum squared resid	0.043877	Schwarz criterion		-1.609046
Log likelihood	67.26714	Hannan-Quinn criter.		-2.249210
F-statistic	16628.92	Durbin-Watson stat		2.644740
Prob(F-statistic)	0.000000			

Source: Authors' computation using (EViews 12)

The result showed that R2 (R-Squared) value of 0.999 was obtained. This implies that 99% of the variations in Gini coefficient is explained by changes in number of commercial bank branches, primary school enrollment, health expenditure, unemployment rate growth rate of GDP and inflation. The high R-squares values indicates that 99.9% of the variation in the Gini coefficient is explained by the model, suggesting an excellent fit, this is confirmed by the high adjusted R-squared which shows that the model remains robust even after adjusting for the number of predictors. The F-Statistics of 16628.92 is significant considering the probability value. This implies that the model has goodness of fit. The Durbin-Watson value of 2.69 suggests that there is no serious autocorrelation issue in the residuals.

The error correction model (ECM) estimates both the short-run dynamics and the long-run equilibrium relationship between income inequality (Gini coefficient) and the independent variables: Commercial Bank Branches (NCBB), Primary School Enrollment (NE), Health Expenditure (HLTEXP), Unemployment (UNEMP), GDP Growth Rate (GDPGRATE), Urbanization Rate (URBRATE), and Inflation (INF).

In the short run, commercial bank branches have a significant negative impact on income inequality in the short run. A 0.1081 decrease in inequality occurs for each increase in NCBB, showing that greater banking access reduces inequality. The significance of D(NCBB(-1)) (positive coefficient) suggests that while initial banking increases reduce inequality, the effect might reverse slightly in subsequent periods. While the Primary School Enrollment coefficients are insignificant in the short run, suggesting that enrollment rates do not have an immediate impact on income inequality. Also, Health expenditure, represented by the coefficients -0.0004 and 0.019, does not show a substantial short-term effect on income inequality based on the insignificant t-statistics.

Unemployment has a strong negative effect on Gini, with a coefficient of -0.3867. This suggests that higher unemployment reduces inequality, which might indicate that unemployment disproportionately affects higher-income individuals in the short run. The lagged unemployment term is also significant but with a smaller coefficient.

GDP growth rate is insignificant in this model, implying that short-term fluctuations in economic growth do not have a direct impact on inequality. D(INF): Inflation significantly impacts inequality, with a mixed result: the current term shows a negative effect (-0.0019), indicating that inflation reduces inequality in the short run, while the lagged term (0.0027) suggests inflation increases inequality after a delay.

Statistically, the ECM term is negative and significant at 5% probability level. The existence of short run equilibrium among the time series in income inequality and financial inclusion is validated by this result. The slope coefficient of the error term in absolute terms (0.0247) represents the speed of adjustment and is consistent with the hypothesis of

convergence towards the long-run equilibrium once economic inequality and financial inclusion equation fluctuates from its equilibrium in the short run.

Table 4: Long run ARDL

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.928928	0.703934	7.001979	0.0000
GINI(-1)*	-0.024739	0.011037	-2.241502	0.0431
NCBB(-1)	-0.199131	0.056274	-3.538592	0.0036
NE(-1)	-0.014850	0.006131	-2.422267	0.0308
HLTEXP(-1)	-0.200677	0.056000	-3.583509	0.0033
UNEMP(-1)	-0.161042	0.065987	-2.440503	0.0297
GDPGR(-1)	-0.017457	0.010314	-1.692526	0.1144
URBRATE**	-0.002778	0.005653	-0.491385	0.6313
INF(-1)	-0.004676	0.002046	-2.285138	0.0397
D(GINI(-1))	1.857710	0.098347	18.88925	0.0000
D(GINI(-2))	-0.970193	0.122610	-7.912852	0.0000
D(NCBB)	-0.108198	0.044416	-2.436034	0.0300
D(NCBB(-1))	0.146885	0.061330	2.395014	0.0324
D(NE)	0.002476	0.004593	0.539048	0.5990
D(NE(-1))	0.016274	0.003201	5.083617	0.0002
D(HLTEXP)	-0.000473	0.032365	-0.014621	0.9886
D(HLTEXP(-1))	0.109318	0.030349	3.602060	0.0032
D(UNEMP)	-0.386704	0.130055	-2.973379	0.0108
D(UNEMP(-1))	-0.236988	0.120225	-1.971202	0.0704
D(GDPGR)	-0.007147	0.006083	-1.174877	0.2611
D(INF)	-0.001955	0.001373	-1.423997	0.1780
D(INF(-1))	0.002662	0.001219	2.184710	0.0478
Levels Equation				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
NCBB	-8.049337	3.135794	-2.566921	0.0234
NE	-0.600266	0.483689	-1.241018	0.2365
HLTEXP	-8.111813	3.487200	-2.326168	0.0368
UNEMP	-6.509675	3.124034	-2.083740	0.0575
GDPGR	-0.705637	0.535965	-1.316572	0.2107
URBRATE	-0.112289	0.231482	-0.485085	0.6357
INF	-0.189010	0.137898	-1.370652	0.1937
C	199.2386	79.26146	2.513688	0.0259

EC = GINI - (-8.0493\*NCBB -0.6003\*NE -8.1118\*HLTEXP -6.5097\*UNEMP -0.7056\*GDPGR -0.1123\*URBRATE -0.1890\*INF + 199.2386)

Source: Authors' computation using (EViews 12)

The ARDL Levels Equation estimates the long-run relationship between the Gini coefficient (representing income inequality) and several key explanatory variables, including the number of Commercial Bank Branches (NCBB), Primary School Enrollment (NE), Health Expenditure (HLTEXP), Unemployment (UNEMP), GDP Growth Rate (GDPR), Urbanization Rate (URBRATE), and Inflation (INF). The results provide insight into how these variables affect income inequality in the long run. The result presented in Table 5 (Conditional Error Correction Long-run Regression result for financial inclusion and inequality) indicates that in the long run, a year lag of (GINI) is significant at 5% level.

The coefficient of -8.049 indicates that a 1-unit increase in the number of commercial bank branches reduces income inequality (GINI) by 8.049 units in the long run. This result is significant with a p-value of 0.0234, confirming that financial inclusion, driven by an increase in bank access, leads to reduced inequality over time. This finding aligns with empirical studies (e.g., Beck et al., 2007; Demirgüç-Kunt & Levine, 2009) that highlight the positive role of financial sector development in reducing inequality through access to credit, savings, and insurance.

The coefficient of -0.6003 suggests that an increase in school enrollment reduces income inequality, though the effect is not statistically significant (p-value = 0.2365). Education is a key factor in human capital development and long-term economic equity. Theoretically, better education access improves upward mobility and reduces inequality, but the lack of statistical significance here may indicate that the quality of education or unequal access across regions might limit the potential benefits of increased enrollment in Nigeria.

The coefficient of -8.1118 indicates that increasing health expenditure by 1 unit reduces inequality by 8.1118 units, with a significant p-value of 0.0368. This result highlights the critical role of public health spending in reducing inequality, as better healthcare access disproportionately benefits low-income households. Empirically, public health interventions can reduce inequality by improving the productivity and earning potential of poorer segments of the population (Deaton, 2003).

The coefficient of -6.5097 indicates that an increase in unemployment reduces inequality in the long run, although the p-value (0.0575) suggests borderline significance. This negative relationship might reflect the specific dynamics in certain labor markets where unemployment disproportionately affects higher-income earners. However, this is not consistent with typical economic theory, which suggests that higher unemployment worsen inequality by reducing incomes for low-wage

workers (Piketty, 2014).

The coefficient for GDP growth is  $-0.7056$ , implying that economic growth reduces inequality in the long run, though it is statistically insignificant ( $p$ -value =  $0.2107$ ). Economic growth generally has mixed effects on inequality depending on whether the benefits are distributed evenly across the population. Studies by Kuznets (1955) from developing countries suggest that growth can initially increase inequality before reducing it at higher levels of development.

The coefficient of  $-0.1123$  indicates a small negative effect of urbanization on inequality, but this result is statistically insignificant ( $p$ -value =  $0.6357$ ). Urbanization can lead to both rising and falling inequality depending on factors such as migration, job creation, and access to services. The insignificant result here may suggest that the effects of urbanization on inequality are mediated by other factors such as infrastructure and social services.

The coefficient of  $-0.1890$  indicates a small negative effect of inflation on inequality, but it is statistically insignificant ( $p$ -value =  $0.1937$ ). This contrasts with empirical findings (e.g., Easterly & Fischer, 2001) that suggest inflation typically worsens inequality by eroding the purchasing power of the poor. The insignificant result may be due to the complexity of inflation dynamics or the specific inflation experience in the period studied. The constant term of  $199.2386$  is significant, suggesting a base level of inequality that is independent of the explanatory variables in the model.

### 4.3 Hypothesis testing

H<sub>1</sub>: Higher levels of financial inclusion lead to lower levels of income inequality.

The result from our analysis indicate that financial inclusion variable represented by Commercial bank branches (per 100,000 adults) exert a negative and significant relationship with inequality. The significant negative coefficient on NCBB supports the theoretical argument that financial inclusion plays a critical role in reducing inequality. Greater access to banking services facilitates savings, investments, and risk management for low-income individuals, which helps reduce income inequality. This finding aligns with the financial development literature that emphasizes how financial services reduce barriers to economic participation for disadvantaged groups (Beck et al., 2007). This further support our hypothesis that higher levels of financial inclusion lead to lower levels of income inequality. We therefore infer that a higher level of financial inclusion leads to lower levels of income inequality given that financial inclusion grants financial empowerment and income generating opportunities to segments of the population that had been excluded from the benefits of economic growth.

### 4.4 Granger Causality Test

To determine the causal relationship between financial inclusion and inequality in Nigeria, the Pairwise Granger Causality test was carried out and the extracted result is presented in Table 5 below;

Table 5: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
NCBB does not Granger Cause GINI	36	2.74496	0.0799
GINI does not Granger Cause NCBB		0.65359	0.5272
NE does not Granger Cause GINI	36	5.40050	0.0097
GINI does not Granger Cause NE		4.45197	0.0200
HLTEXP does not Granger Cause GINI	36	0.41019	0.6671
GINI does not Granger Cause HLTEXP		1.92554	0.1628
UNEMP does not Granger Cause GINI	36	1.50894	0.2369
GINI does not Granger Cause UNEMP		0.94475	0.3997
GDPGR does not Granger Cause GINI	36	3.92986	0.0301
GINI does not Granger Cause GDPGR		3.03495	0.0626
URBRATE does not Granger Cause GINI	36	14.5231	4.E-05
GINI does not Granger Cause URBRATE		7.79680	0.0018
INF does not Granger Cause GINI	36	1.69332	0.2005
GINI does not Granger Cause INF		7.86718	0.0017

The table presents Granger causality test results between the Gini coefficient (GINI, a measure of income inequality) and several explanatory variables. Granger causality tests whether one time series can predict another. A low  $p$ -value indicates that the null hypothesis (e.g., "NCBB does not Granger cause GINI") can be rejected, suggesting that NCBB helps predict GINI (or vice versa). Below is an interpretation of the results:

The Granger causality test shows a one-way direction causal between commercial bank branches proxy for financial inclusion and Gini coefficient, The  $p$ -value ( $0.0799$ ) is just above the 5% significance level but significant at 10%, indicating that NCBB Granger causes GINI. This implies that the number of commercial bank branches can predict future changes in income inequality, suggesting that financial inclusion can influence inequality over time.

In summary, bidirectional granger causality exist between NE (Primary School Enrollment) and Gini, meaning that school

enrollment and inequality influence each other over time and URBRATE (Urbanization) and GINI indicating that changes in urbanization and inequality are mutually predictive. Unidirectional granger causality exist between GDP Growth and GINI, GDP growth significantly predicts changes in inequality, but there is only weak evidence that inequality affects growth. Income inequality Granger causes inflation, but inflation does not predict changes in inequality. Also, commercial bank branches proxy for financial inclusion granger causes Gini coefficient. While, no granger causality for health expenditure, and unemployment, was found with inequality, suggesting that these variables do not strongly predict inequality, nor are they predicted by inequality in this context.

#### 4.5 Stability Test

It is ideal to investigate the stability of ARDL model. For this purpose, we have checked the stability of the model parameters using both cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) test procedures. CUSUM and (CUSUMSQ) are plotted against the break points. The plot of the CUSUM and (CUSUMSQ) are obtained from a recursive estimation of the model.

The graph (figure 1 and 2) below depicts the results for CUSUM and (CUSUMSQ) test. The results indicate stability in the coefficients of the model, because the plots of the CUSUM statistic fall inside the critical bounds of 5% confidence interval of parameter stability.

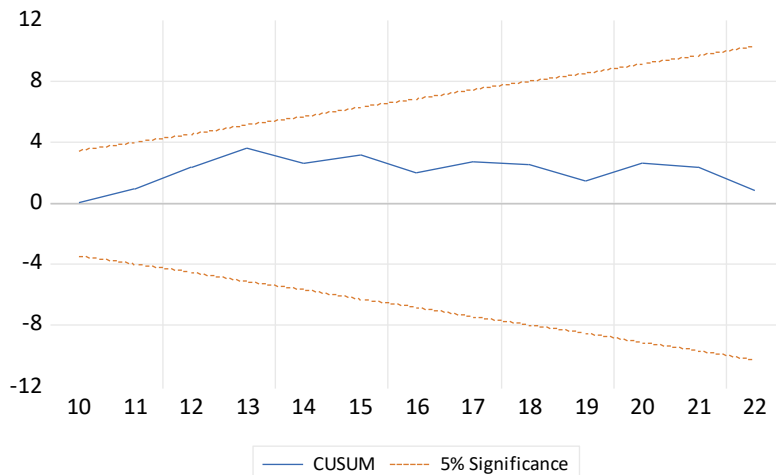


Figure 1: Cumulative Sum of Recursive Residuals (CUSUM)

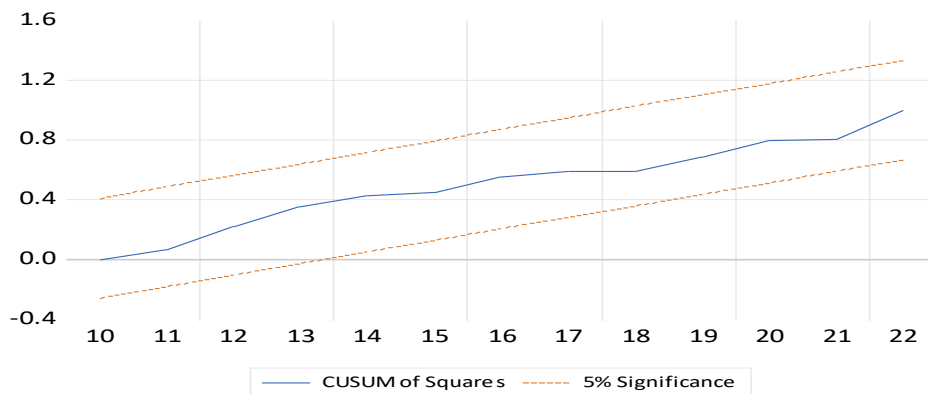


Figure 2: Cumulative sum of Squares of Recursive Residuals (CUSUMSQ)

## 5 Summary, Conclusion and Recommendation

### 5.1 Summary

The study examined the relationship between financial inclusion and income inequality in Nigeria from 1985 to 2022 using an ARDL (Auto-Regressive Distributed Lag) model and Granger causality analysis. The findings highlight the role of various financial and socio-economic variables, such as bank branches (NCBB), education expenditure (NE), health expenditure (HLTEXP), unemployment (UNEMP), GDP growth (GDPGR), urbanization (URBRATE), and inflation (INF) in influencing income inequality (GINI).

Both long-run and short-run dynamics were analyzed to understand the impact of financial inclusion on inequality. In the long run, financial inclusion variables such as the number of commercial bank branches (NCBB) have a significant negative impact on income inequality. This indicates that increased access to banking services contributes to reducing inequality by providing marginalized populations with access to credit and financial services. However, other variables such as inflation (INF) and unemployment (UNEMP) also have significant effects, showing that macroeconomic stability and job creation are essential for reducing inequality. NCBB (Financial Inclusion Proxy) has a significant negative impact on inequality, indicating that expanding access to financial services reduces the income gap. Health Expenditure (HLTEXP) significantly reduces inequality, underscoring the importance of public spending in improving living conditions and reducing disparities. Unemployment (UNEMP) worsens inequality, suggesting that high unemployment rates worsen income disparity. GDP Growth (GDPGR) has an insignificant effect, showing that while growth is crucial, it doesn't directly translate into income redistribution without targeted measures. Inflation (INF) though insignificant, its negative coefficient indicates that inflation worsens inequality by reducing the purchasing power of the poor.

In the short run, financial inclusion and government spending have an immediate but less profound effect on inequality. The effects of unemployment and inflation are more apparent, highlighting the importance of managing short-term economic stability to mitigate inequality. The short-run coefficients suggest that financial inclusion policies need sustained effort over time to have substantial effects. Granger causality tests reveal a bidirectional causality between income inequality (GINI) and economic growth (GDPGR) as well as unidirectional causality from financial inclusion (NE) and urbanization (URBRATE) to inequality and from commercial bank branches to (GINI). This means that while financial inclusion initiatives help reduce inequality, inequality itself influences economic variables such as urbanization and economic growth. These findings are generally consistent with both theoretical expectations and empirical literature, emphasizing the importance of inclusive financial policies and sustainable economic growth in reducing inequality.

## 5.2 Conclusion

The study demonstrates that financial inclusion plays a vital role in reducing income inequality in Nigeria. Expanding access to banking services, public spending on health and education, and managing unemployment are crucial for reducing the income gap. However, economic growth alone does not significantly address inequality, suggesting the need for targeted redistributive policies. Urbanization and inflation also require careful management, as both can exacerbate income disparities. This analysis provides evidence that financial inclusion and government social spending are key to reducing inequality in Nigeria, but these must be complemented by efforts to create jobs and maintain macroeconomic stability. The lesson that this study has garnered is that financial inclusion variables well explain reduction in inequality in Nigeria. This means that everything should be done within the policy institutions, financial sector and the general public to intensify financial inclusion and economic growth so as to minimize if not eliminate income inequality and poverty among Nigerians.

## 5.3 Recommendation

- i. Increase Commercial Bank Branches (NCBB): The study finds that an increase in the number of bank branches significantly reduces income inequality. The Nigerian government and financial regulators should incentivize banks to expand their services to underserved rural areas and low-income urban regions, providing easier access to banking, savings, and credit facilities. This should be complemented through promotion of digital financial services, such as mobile banking, to enhance financial inclusion among people without access to traditional banking services. Mobile banking platforms and fintech can be used to provide financial services to individuals in remote areas, increasing access to credit and savings products.
- ii. The government should focus on improving access to quality education, particularly for the disadvantaged. Programs that emphasize skill-building, vocational training, and financial literacy can enhance employment opportunities and wage potential, leading to more equitable income distribution.
- iii. Unemployment was found to affect income inequality, underscoring the importance of job creation. The Nigerian government should prioritize policies that support job creation, especially for the youth and rural populations. Encouraging entrepreneurship and small-scale enterprises through targeted financial support programs can create job opportunities and reduce dependency on informal and low-income employment.
- iv. High inflation exacerbates inequality, as it disproportionately affects low-income households by eroding their purchasing power. The Central Bank of Nigeria (CBN) should focus on stabilizing inflation through prudent monetary policies. Managing inflation is critical for ensuring that the benefits of financial inclusion and other social policies are not undermined by rising costs of living.
- v. The study finds that public health expenditure significantly reduces inequality. Therefore, strengthening social safety nets, including health insurance programs and direct cash transfers, can play a critical role in redistributing wealth and protecting the most vulnerable segments of society.
- vi. Investment in public health infrastructure and services can mitigate inequality by improving access to healthcare for low-income populations, thereby increasing productivity and quality of life. Expanding universal healthcare coverage and targeting health investments toward underserved regions can reduce health-related poverty and inequality.

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The authors declare that they have no conflicting interests.

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### **Data Availability statement**

The data used to support the findings of this study are available upon request, from the corresponding author.

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**Appendix 1: Empirical Data on financial inclusion and inequality in Nigeria from 1985-2022**

YEAR	GINI	NCBB	NE	HLTEXP	UNEMP	GDPGR	URBRATE	INF
1985	38.7	4.361576	105.5981	3.239611	3.963567	5.9	25.635	7.44
1986	39.1	4.361514	92.14323	3.238669	3.963903	0.06	26.414	5.72
1987	39.56	4.361341	88.36357	3.239173	3.966723	3.2	27.209	11.2
1988	40.14	4.361548	84.22716	3.24003	3.959578	7.33	28.019	54.51
1989	40.91	4.361901	82.07581	3.240574	3.964063	1.92	28.842	50.47
1990	41.94	4.361268	85.5114	3.234902	3.96525	11.78	29.68	7.36
1991	43.28	4.360646	84.68907	3.241186	3.978	0.36	30.176	13
1992	45	4.362379	89.27564	3.243457	3.931	4.63	30.677	44.59
1993	47.07	4.36331	94.07119	3.24275	3.982	-2.04	31.182	57.17
1994	49.19	4.358738	94.46262	3.212213	3.97	-1.81	31.691	57.03
1995	50.93	4.358156	90.42667	3.266326	3.945	-0.07	32.205	72.84
1996	51.9	4.36931	79.55597	3.252537	3.898	4.2	32.725	29.27
1997	51.79	4.367036	89.62911	3.239924	3.9	2.94	33.247	8.53
1998	50.75	4.340453	88.51859	3.090067	3.893	2.58	33.773	10
1999	49.02	4.355826	95.17621	3.482775	3.901	0.58	34.304	6.62
2000	46.84	4.413924	99.20211	3.197383	3.852	5.02	34.84	6.93
2001	44.47	4.357939	95.93709	3.189469	3.838	5.92	35.669	18.87
2002	42.14	4.234121	97.06742	2.49064	3.751	15.33	36.508	12.88
2003	40.1	4.41732	98.17258	5.05361	3.812	7.35	37.356	14.03
2004	38.54	4.646316	99.18395	4.633684	3.789	9.25	38.212	15
2005	37.43	4.134	99.78027	4.465919	3.807	6.44	39.074	17.86
2006	36.7	3.73885	100.1878	4.257751	3.803	6.06	39.943	8.23
2007	36.24	5.150113	91.43144	3.909972	3.791	6.59	40.819	5.39
2008	35.98	6.197144	82.3805	3.695815	3.782	6.76	41.702	11.58
2009	35.83	6.41095	83.4957	3.580197	3.763	8.04	42.588	12.54
2010	35.7	6.492203	83.01659	3.296533	3.755	8.01	43.48	13.74
2011	35.55	6.328748	88.08551	3.320779	3.77	5.31	44.366	10.83
2012	35.5	5.737434	89.39999	3.359843	3.75	4.23	45.246	12.22
2013	35.63	5.821216	91.37197	3.420693	3.7	6.67	46.118	8.5
2014	35.82	5.530492	87.44564	3.348404	3.944	6.31	46.982	8.05
2015	35.9	4.918974	83.74982	3.58195	4.221	2.65	47.838	9.01
2016	35.72	4.683292	81.91617	3.647737	4.509	-1.62	48.683	15.7
2017	35.4	4.381587	76.4631	3.747625	4.729	0.81	49.519	16.5
2018	35.1	4.24944	84.67606	3.090693	4.963	1.92	50.344	12.1
2019	34.94	4.730676	83.25739	2.985471	5.206	2.21	51.157	11.4
2020	34.92	4.40098	87.3721	3.380634	5.999	-1.79	51.958	13.25
2021	34.99	4.241155	86.72343	4.076257	5.936	3.65	52.746	16.95
2022	35.1	4.364872	85.50725	3.383264	5.761	3.25	53.521	18.85

Source: World Bank 2022, CBN 2022