Original Research Article

Impact of Income Inequality on Poverty Level in Nigeria: Evidence from ARDL Model

Abstract

This study examined the impact of income inequality on the poverty level in Nigeria using Auto Regressive Distributed Lag (ARDL) model. The findings of the study revealed that there is a long-run positive relationship between the poverty level and the Gini coefficient of income inequality in Nigeria and based on the relationship each determinant of income exhibited with the Gini coefficient of income inequality in Nigeria's economy. It is therefore recommended that to enhance a more evenly distribution of income which would in effect, reduce income gap and poverty in Nigeria. Efforts of the government should be mobilized towards the formulation and implementation of more pragmatic employment policies in Nigeria. Since the empirical findings in this research work have shown that a rise in the employment rate has not been sufficient to reduce inequality of income inequality in Nigeria. A more pragmatic employment policy would enable workers to create wealth from their income (and not just for sustenance) which enhances a more evenly distributed income.

Keywords: ARDL Modeling, Income Inequality, Nigeria and Poverty Level

JEL Classification Code: E6; A1

1 Introduction

The Global and shared prosperity index broadens the way we define and measure poverty. World Bank (2019). There is widespread concern about global inequality and economic growth that the economic crisis has only widened the gap between the rich and the poor (Magaji, 2002). This has necessitated the need to examine the pattern of inequality in global and emerging countries. This has triggered a lot of concern to examine the multiple causes linked to growing income inequalities such as globalization, technological change and changes in distribution policies. It also assesses the effectiveness of social and labour market policies in tackling poverty and high inequalities. Over the years, the Organization for Economic Cooperation and Development (OEDC), has collected a significant level of evidence on the extent and drivers of inequalities, social mobility and equal opportunity including policy responses on how to address these issues. This evidence has shown how reducing inequality globally can be highly rewarding for the global society as a whole. (OEDC, 2021).

Income inequality and the level of poverty are critical indicators of economic development (Silver, 2013). Developed nations are those with reduced economic inequality and low rates of poverty, whereas underdeveloped or developing nations are those with highly skewed or uneven income

inequality and high rates of poverty (Aluko and Magaji, 2020). Because of the impact that growing income inequality has on the political, social, and economic stability of a country, income inequality and poverty have remained hot topics in both local and global debates (Shaba, et al, 2018). This is also evident in the sustainable development goals of the United Nations, which call for, among other things, the eradication of poverty and an increase in the income of the poorest 40% of developing nations. Additionally, the international monetary fund (IMF) highlighted the significance of income inequality as an important factor in economic growth (Ostry, Berg, and Tsangarides 2014).

There have been widespread worries that economic progress is not being equitably distributed throughout the world. Poverty and income inequality are two interrelated and mutually reinforcing developmental issues in Africa. Oxfam (2019) noted that the continent remains afflicted by an alarmingly high and rising inequality and entrenched poverty. (Chancel, Cobgeau, Gethin, and Myczkowski, 2019) stated that despite strong economic growth in many African countries, human development and poverty indicators have not progressed as expected, fueling a renewed interest in the study of inequality as is seen as one of the main causes of Present a new measure of societal poverty, integrating the absolute concept of extreme poverty and a notion of relative poverty reflecting differences in needs across countries. It is centred on multidimensional poverty measures that are anchored on household consumption and the international poverty lines of 1.9 dollars per person a day but broadens the measures to include information on access to include education and basic infrastructures. It also troughs more light on the poverty differences within households gender, and age. The weak poverty-alleviation elasticity of growth.

The National Bureau of Statistics (NBS) recently released the 2019 poverty and inequality in Nigeria. The report highlights that 40% of the population or almost 83 million people live below the country's poverty line of 137,430 naira ($381.75) per year. The NBS report is based on data from the latest round of Nigeria's Living Standard Survey, conducted from 2018 to 2019 with support from the World Bank's poverty global practices and technical assistance from the NLSS program. Nigerian Living Standard Survey (NLSS) is the official survey that is the bases for measuring poverty and living standards in the country and is used to estimate a wide range of socio-economic indicators including benchmarking of the sustainable development goals. Between September 2018 and October 2019, the national bureau of Statistics conducted the latest round of NLSS a decade after the previous one. The World Bank provided technical support to the NBS throughout the implementation, introducing several methodological improvements that led to the availability of reliable data for the poverty estimate. (NBS, 2020)

In Nigeria, the scale of inequality is quite extreme. Oxfam (2019) particularly noted that the paradox of growth in Nigeria is such that as the country gets richer, only a few benefits, while the majority continue to suffer from poverty and deprivation. Now dubbed the poverty capital of the world, recent data according to Quartz Africa (2018) reveals that 86.9 million Nigerians now live in extreme poverty representing nearly 50% of its estimated 180 million population- Nigeria is multi-dimensionally poor. Furthermore, the Oxfam (2019) report ranking African nations by their commitment to tackling

inequality ranked Nigeria as the 45th out of 45 countries, stating that Nigeria has the unenviable distinction of being at the bottom of the African ranking, as well as its global ranking for two years running. Government indifference to inequality in the country portends a serious challenge.

Achieving inclusive growth is hampered by negative income disparity. Income disparity is receiving more empirical attention as a result of the unfavourable environment it creates for growth. As a result, (Yunqian, 2017) argued that addressing poverty also necessitates policies to address inequality, asserting that it is conceivable to be worried about poverty while being indifferent to inequality. Therefore, the importance of being concerned about economic disparity cannot be overstated because it has a significant impact on poverty. This is because greater inequality will almost always imply greater levels of poverty for a given level of average income. Similar to how rising levels of poverty will necessitate redistribution toward the poor, addressing the issue of pervasive income inequality will also require developing policies, which form the basis for this study, which covers the years 1986 to 2021.

Therefore, the main issue with this study is that, despite previous policy interventions (such as the national poverty eradication programme, family economic advancement programme, and family support programme, among others) to achieve inclusive growth, which is defined by increased GDP reduction in inequality and, consequently, poverty, the issue of poverty still exists, necessitating a critical evaluation of how inequality affects poverty. This study intends to look at the impact of income inequality on the Nigerian poverty level.

2 Literature Review

Kopp (2019) defined income inequality as “an extreme disparity of income inequality with a high concentration of income usually in the hands of a small percentage of a population". Therefore, there is a big difference in wealth between different demographic groups when there is income inequality. Income inequality and income disparity segregations can be assessed by a variety of segmentations, including occupation, historical income, male versus female, ethnicity, and geographic area (Musa and Magaji, 2023). Because different types of income inequality are examined using different segmentations of income disparity analysis, income inequalities by demographic segmentation serve as the basis for research on income inequality and disparity.

Income inequality has traditionally been viewed as the pattern of incomes of the rich and the poor in any economy, with significant research on the topic focusing on the descriptive method of analysis. In the past, diverse results of surveys on income inequality were produced by different writers. In their 2021 study, Emmanuel and Willie focused on the factors that contribute to poverty in Nigerian agricultural households inflation. Their study was accepted. The influence of the socio-economic variables on poverty among agricultural households was estimated using the National Bureau of

Statistics (NBS) measure of poverty and the logit regression model. Their findings indicated that farming households' inflation experienced a high rate of poverty. The main predictors of poverty among farming households inflation were found to be age, household size, income, and the number of farms.

From a country's perspective, a variety of internal and foreign factors may influence income disparity. One such significant external factor is globalization. The relationship between income inequality, growth, and globalization has long drawn the attention of academics. However, except for a partial view in studies like Agénor (2013) who looked at the relationship between inequality and the economic components (trade, FDI and financial openness) of Globalisation, the lack of a Globalisation index has not allowed statistical estimation and testing of the relationship. In this section we aim to address this using regression analysis:

$$GINI = \alpha_0 + \alpha_1 GINDEX + u_t \quad (2.1)$$

The Gini coefficient and the globalization index, respectively, are abbreviated as GINI and Gindex, respectively. The region is a J Vector of regional dummies, u is an error term, and the subscript I denotes a country. We were obliged to utilize a cross-sectional technique to establish the association as a second-best option because the two datasets, Kearney and Wiid, do not overlap. The Wiid covers the time before 1998, while the Kearney database covers the years 1995 to 2000. While the latter observes 146 countries irregularly and non-consecutively, the former is a balanced panel data of 62 countries.

It is common practice to measure income disparity using the Gini coefficient. It is presented as the average of numerous observations made for a certain nation during a given year. The variety of observations is brought on by the various definitions of income, area coverage, and measuring units. Here, it is defined in two distinct ways. The cross-sectional regression analysis begins by using the most recent observation (1996 to 1998). Before 1995, sixteen countries were observed. The mean Gini by the nation for all the years a country is observed is used for the second definition in place of the most recent year of observation.

According to (Chen, Catalano and Williams 2023) the term poverty refers to the state or condition in which people or communities lack the financial resources and essentials for a minimum standard of living. As such, the basic human needs cannot be met. Poverty-stricken people and families may go without proper housing, clean water, healthy food and medical attention. Each nation may have its criteria for determining the poverty line and counting how many of its people live in poverty. It's important to remember that poverty is a socioeconomic condition that is the result of multiple factors-not just income. These factors include race, sexual identity, sexual orientation and little to no asses to education among others. Poverty is both an individual concern as well as a brother social problem on the individual or household level, not being able ends needs can lead to a range of physical and mental issues. At the societal level, a high poverty rate can be a damper on economic growth and be associated with problems like crime, unemployment, urban decay, education, and poor health. The government often put socio-economic welfare program in place to help lift individuals, families and

community out of poverty. (Chen et al 2023). Some countries have a stronger welfare state (social safety net) than others. The U.S. for instance, tend to be much more individualistic and sure welfare programs. European countries in comparison, have a much brother range of welfare programs and support for those in need. The Department of Health and Human Services (HHS) designates those who do not make it into a particular income household as being in poverty. The U.S. Census Bureau calculates the poverty rate in the United States or the proportion of the population that lives in poverty. The poverty line in 2022 is $27,750 annually for a family of four with two children under the age of 18. In 2022, the poverty line will be $18,310 per year for two persons over 65 without a child under the age of 18. (Chen et al, 2023).

In their article titled "rethinking inequality decomposition with Evidence from Rural China" published in 2021, Morduch and Sicular introduced a new regression-based method for breaking down inequality indices using household-level data. They also looked at the advantages and disadvantages of breaking down inequality by income source in comparison to how they are typically interpreted. The method breaks down aggregate inequality indices using estimated income flows from variables in linear income equations. In a multivariate environment, the integrated approach offers an effective and adaptable way to measure the contributions of variables including education, age, infrastructure, and social status. The evidence from China indicates the benefits of the suggested, integrated method and highlights the stark disparities that might occur when using decomposition techniques with different features. The empirical findings highlight the role that spatial segmentations play in escalating inequality: in the sample, the village of residence greatly influences inequality. The relatively equitable distribution of human capital, especially demographic factors, acts as a partial counterbalance to this force. Affiliation with the communist party and indicators of social position, in contrast to previous recent studies, play a very small influence in explaining inequality. This also was done in rural China and not Nigeria

But in an empirical study titled "Decomposition of inequality reconsidered: some evidence from Nigeria," Alayande (2020) decomposed income inequality and poverty in Nigeria using the regression-based decomposition approach created by Morduch and Sicular (2018). She found that while the number of unemployed people in a household had a positive impact on income inequality, primary and postsecondary educational attainment was important in reducing it. This investigation focuses on unemployment in households and not on improved knowledge or effective labour.

In his article titled "labour force participation, earnings and income inequality in Nigeria" Additionally, Jacobs (2020) discovered through empirical research that the percentage of total income disparity in Japan, Taiwan, and South Korea can be attributed to inequalities in age groups is relatively low (less than 5%). When compared to the mean of different age groups, inequality is significantly more common among people who fall into the same age category. In other words, neither of the three countries' wealth inequality nor a large portion of it can be attributed to age. Also, Nigeria was not included in this study.

Moreover, Adesimi (2020) analyzed the structure of rural-urban income inequality vis-à-vis occupational groups and surveyed the four major states in the western part of the country that is, Lagos, Ogun, Ondo and Oyo. To weigh and evaluate the rural and urban sectors of the economy, factors such as population, key economic activity, services, and industrialization level were taken into consideration. He noted that in the three states of Oyo, Ondo, and Ogun for which data are available, the rural sector received 38.3% of the taxpayer's income.

Kennedy (2019) examined the impact of governance on income inequality and income inequality in Nigeria using the Federal government's trader Moni social intervention policy programme. The study used content analysis to examine the strategy between 2018 and 2019. The execution of Trader Moni's social intervention policy was deemed to have fallen short of achieving its stated goal of income redistribution. According to the study, Africa's level of economic disparity is comparable to that of Latin America or India. It demonstrated the extreme inequality in southern and central Africa. Additionally, the within-country component accounts for the majority of the continent's income inequality, while the between-country component has marginally decreased over the past two decades as a result of faster growth in developing nations. Furthermore, except in southern Africa, inequality was comparatively consistent across the period. The duality between agriculture and other industries, including mining rents, was another significant factor in determining inequality. This was focused on the Federal Government social policy intervention programme which is different from the parameter used in this study.

Based on the literature reviewed, there appeared to be a gap specifically on the relationship between income inequality and poverty level in Nigeria. This study will investigate the mechanism through which income inequality affects poverty level such as low level of income. Also, a lot of researches are required in order to understand the real relationship between income inequality and poverty level so as governments at various level should bring up policies that will break down the level of inequality in income distribution.

3 Methodology

3.1 Source and Analysis of Data

This study made use of secondary data. They were retrieved from the World Bank database, the annual CBN statistical bulletin database, the National Bureau of Statistics (NBS) databank, the United Nations Development Programmes (UNDP) World Income Inequality Database (WIID), and the NBS databank. The study examined data from 1981 to 2021 for its analysis.

The Autoregressive Distributed Bounds Test (ARDL) was used to accomplish the goals of this investigation. The adoption of the ARDL technique suggested by Pesaran, Shin and Smith (2001) is the result of its advantages over traditional co-integration techniques when applied to small sample sizes, its ability to simultaneously test both short-run and long-run relationships while providing unbiased results, and the fact that it tests variables regardless of whether they are differences of order zero or order one.

Theoretical Framework and Model Specification

The social capital theory, which emphasizes that social connections are resources that can contribute to the growth and accumulation of human capital or not, forms the foundation of the study. The hypothesis is predicated on the idea that social interactions may make it easier for people to accrue benefits for themselves, whether they be financial or not. The impact of social ties, here represented by income disparity, on poverty, which symbolizes the condition of human capital, captures the theoretical relevance of the idea.

The research modified the Musa, Magaji, Eke and Yakeen (2022) model. As a result, it models poverty (POVT) as a function of the unemployment rate (UNEMT), inflation rate (INFT) and Human Development Index (HDI). Equations [3.1] and [3.2] provide the functional and econometric forms of the model, respectively;

$$POV = f(UMP, POP, HDI) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . (3.1)$$

This is shown in econometrics format:

$$POV = \beta 0 + \beta 1 UMP + \beta 2 POP + \beta 3 HDI + Ut \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (3.2)$$

Therefore, this study modified its model as

$$POVR = \beta 0 + \beta 1 INQ + \beta 2 UNEMP + \beta 3 INFL + Ut \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.3)$$

Where;

POVR = Poverty Rate

INQ = Income Inequality

UNEMP = Unemployment

INFL = Inflation

$\beta 1, \beta 2, \beta 3$ and $\beta 4$ = Coefficient of the variables

ut = Error term

A priori Expectation

Economic a-priori, which is used to explain the sign and size of the parameters in the model and as well as explain the movement of variables (independent and dependent variables) in the models, will be checked to determine whether they conform to economic theory.

The a-priori expectations are: $\beta 1<0$; $\beta 2 < 0$; $\beta 3 > 0$.

Estimation Technique

Stationarity test

To test for stationarity, the unit-root method will be used and will take the form of an autoregressive model (ar process), with each variable regressed on its own lagged value without an intercept and a deterministic trend. To correct autocorrelation in the error term, the ADF unit root test will be applied. The model used is:

$\Delta y_t = \beta_1 + \beta_2 t + \delta y_{t-1} + \sum^{m}_{i=1} \alpha_i \delta y_{t-i} + \varepsilon_t$ ……(3.4)

$\Delta = \rho - 1$

Where; y represents all the variables under consideration, δ represents the coefficient of the lagged value of y, δ is the first difference operator, y_{t-i} represents the lagged terms included, and ε_t represents the pure white noise error term.

Co-integration test

ARDL bound test of co-integration by Pesaran (2001) was carried out. The ARDL approach to co-integration is recommended in cases where the variables have different orders of integration that is i(0) and i(1).

$\Delta HORt = \alpha 0 + \sum mj{=}1\ \alpha 1 j \Delta HORt{-}j + \sum mj{=}1\ \alpha 2 j \Delta INFt{-}j + \sum mj{=}1\ \alpha 3 j \Delta HPIt{-}j + \sum mj{=}1\ \alpha 4 j \Delta PCIt{-}j + \sum mj{=}1\ \alpha 5 j \Delta PHEt{-}j + \theta 1 HORt{-}1 + \theta 2 INFt{-}1 + \theta 3 HPIt{-}1 + \theta 4 PCIt{-}1 + \theta_5 PHE_{t-1} +$ ---------- (3.5)

Testing the co-integration relationship is based on the f-statistic. Since the asymptotic distribution of this f-statistic is non-standard irrespective of whether the variables are *I (0)*or *i(1)*, Narayan (2005) tabulated two sets of critical values which are appropriate for the studies with small sample sizes ranging from 30 to 80 observations. In this "sense, one set assumes that all variables are *i(0)* and the other set assumes that all variables are *i(1)*. This provides a bond covering all possible classifications of the variables. If the calculated f-statistic lies above the upper level of the bound, the h_0 is rejected, supporting the co-integration relationship. If the calculated f-statistic lies below the lower level of the bound, then the h_0 cannot be rejected, indicating lack of co-integration" Narayan (2005).

Given the rationale provided above, the ARDL model employed in this work is as follows:

$$\Delta POVR_t = \beta_0 + \sum \delta_1 \Delta POVR_{t-1} + \sum_{t=i}^{p} \delta_2 \Delta INQ_{t-1} + \sum_{t=i}^{p} \delta_3 \Delta UNEMP_{t-1} + \sum_{t=i}^{p} \delta_4 \Delta INFL_{t-1} + \beta_1 POVR_{t-1} + \beta_2 INQ_{t-1} + \beta_3 UNEMP_{t-1} + \beta_4 INFL_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots (3.6)$$

Where β_0 is intercepted,

T is the time dimension while

Δ is the difference operator and

μ is the error term.

The long-run co-integration is estimated using equation [3.6];

$$\Delta POVR_t = \beta_0 + \sum \delta_1 \Delta POVR_{t-1} + \sum_{t=i}^{p} \delta_2 \, \Delta INQ_{t-1} + \sum_{t=i}^{p} \delta_3 \, \Delta UNEMP_{t-1} + \sum_{t=i}^{p} \delta_4 \, \Delta INFL_{t-1} + ⍰ \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . (3.7)$$

Based on the automatic lag length selection, the ARDL maximum lag (p q) is chosen. The study used the long-run estimate from equation [3.7] to estimate the short-run dynamic parameter using the error correction model (ECM).

$$\Delta POVR_t = \beta_0 + \sum \delta_1 \Delta POVR_{t-1} + \sum_{t=i}^{p} \delta_2 \, \Delta INQ_{t-1} + \sum_{t=i}^{p} \delta_3 \, \Delta UNEMP_{t-1} + \sum_{t=i}^{p} \delta_4 \, \Delta INFL_{t-1} + \delta ECM_{t-1} + ⍰ \ldots \ldots \ldots \ldots \ldots \ldots \ldots .. (3.8)$$

In equation [3.7], $\delta_1, \delta_{2,}\delta_3, \delta_4, and \; \delta_5$ are short-run dynamic coefficients convergent to long-run equilibrium, and is an error correction model's speed of adjustment parameter derived from the predicted equilibrium relationship.

The Bound Test

To evaluate if there is a long-term link between the variables, the bound test typically models the ARDL equation using the least squares method. The f-statistics test is then undertaken to determine the joint significance of the coefficient of lagged variables. H_0: $\delta_1, = \delta_2 = \delta_3 = \delta_4$ =1δ_5 =0 is in opposition to the alternative, h_1: $\delta_1, \neq \delta_2 \neq \delta_3 \neq \delta_4$ ≠1δ_5 ≠0. The crucial value is examined in comparison to the derived f-statistics.

4. Results and Discussion

Descriptive Statistics

These statistics are used to summarize the samples and observations that serve as the foundation for the description of the data set, including measures of central tendency (mean, median, and mode); measures of variability (standard deviation, variance); and the minimum and maximum values of variables (kurtosis and skewness).

The time-series data (from the year 1986 to 2021) used for the study was obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, (2021), the National Bureau of Statistics (2021), and the world bank database. The unemployment, inequality rate, and inflation rate data were obtained from the CBN, while poverty reduction data and the per capita income data were obtained from the National

Bureau of Statistics (NBS) and the World Bank database respectively. Furthermore, the study adopted the autoregressive distributed lag (ARDL) model for the analysis which was proposed by Pesaran, Shin and Smith, (2001). The choice of this method is premised on the fact that the data are stationary at both levels I (0) and first differenced i(i). This method is suitable for data with an admixture of any level of integration [i(0) and i(i)] and also helps to reveal both short-run and long-run situations. The decision of this method was based on the results of the unit root test for stationarity where UNEMP, INQ, and INFL were stationary at the first difference i(i); while POVR and PCI were stationary at a level i(0). However, since some of the data (UNEMP, INQ, and INFL) were not stationary at the level, there was a need for a cointegration test. Since they are not stationary at a level means that there is no relationship between them in the short run which called for testing in the long run if there is a long-run relationship. Hence, this called for a bound cointegration test.

Table 1: Descriptive Statistics

	UNEMP	POVR	INQ	INFL
Mean	51.53268	61.70927	8.293659	3.336585
Median	46.82000	63.10000	7.490000	3.600000
maximum	86.00000	71.30000	27.04000	33.70000
minimum	43.00000	52.99000	0.130000	-13.10000
std. Dev.	13.36866	6.012061	8.225641	7.199367
skewness	1.833326	-0.125972	0.643629	1.320395
kurtosis	4.689072	1.676194	2.166594	9.594182
jarque-bera	27.84121	3.102228	4.017313	86.19739
probability	0.000001	0.212012	0.134169	0.000000
Sum	2112.840	2530.080	340.0400	136.8000
sum sq. Dev.	7148.843	1445.795	2706.447	2073.235
Observation	36	36	36	36

Source: Author's Computation using E-view 10, (2023)

The descriptive statistics in Table 1 above provided basic information about the variables to be estimated on their potential relationship. The mean which measures the average values of the data is 51.53268, 61.70927, 302.1915 and 3.336585 for unemployment (UNEMP), inflation (INFL), inequality (INQ) and the poverty rate (POVR) respectively. The median which is the middle score of the data set of the variables is 46.820000, 63.10000, 7.490000, 9.460000 and 3.600000 for the five variables respectively. The values of kurtosis of most variables are less than 3 while some are greater than 3, which means that the distribution is both Platykurtic and Leptokurtic. The Jarque-Bera statistic shows that the variables are normally distributed since the values of the variables are far from zero; while the skewness statistic showed that some variables are positively skewed, except poverty which is negatively skewed. Though, the outcome of the normality checks on the data set is inconsistent with the expected outcomes. However, this does not undermine the reliability of the analysis of the data set in economic decision-making and forecasting since this is just the means to the end and not the end itself.

Table 2: Unit Root Test Result

	ADF	Philip-Perron

Variable	Level	1st difference	Order of integration	Level	1st difference	Order of integration
UNEMP	-2.657570*	-	I(0)	-2.635213*	-	I(0)
INFL	-5.168269***	-	I(0)	-5.161857***	-	I(0)
POVR	-1.410505	-5.846427	I(i)	-1.681904	-5.866561	I(i)
INQ	-1.311675	-7.196952	I(1)	-1.226905	-7.213212	I(1)

Source: Author's Computation Using E-view 10, (2023)

The unit root is conducted to ascertain the stationarity of the data used to prevent our work against spurious regression. Both Augmented Dicky Fuller (ADF) and Philip-Perron (PP) tests were conducted to be very sure of the stationarity of the data. The ADF result showed that unemployment (UNEMP) and inflation rate (INFL) are stationary at a level i(0); while poverty reduction (POVR) and inequality rate (INQ) are all stationary at the first difference i(i). In the same vein, the PP show that two variables (POVR, and INQ) are stationary at the first difference (i(i); while two variables (INFL and UNEMP) are stationary at a level i(0). This means that we have an admixture of i(0) and i(i).

Table 3: Cointegration Test Result

Table 3 showed the bound Cointegration test result to know if there is a long-run relationship among the variables.

F-bound test		Null hypothesis: no levels of relationship		
Test of statistic	**Value**	**Signif. Level (n>35)**	**I(0)**	**I(i)**
F-statistic	4.902071	10%	2.696	3.898
K	4	5%	3.276	4.630
		1%	4.590	6.368

Source: Author's Computation Using E-view 10, (2023)

The bound cointegration test result in Table 3 shows that the f-statistic (4.902071) is greater than the lower i(0) as well as the upper bound i(i) at a 5% level of significance meaning that the null hypothesis of no cointegration is rejected. This is an indication that there is long-run cointegration. That means that there exists a long-run relationship among the variables.

Table 4: Result Estimation

ARDL error correction regression
Dependent variable: d(POVR)
Selected model: ARDL(4, 3, 2, 3, 3)
Case 3: unrestricted constant and no trend
Date: 04/16/23 Time: 10:47
Sample: 1982 2021
Included observations: 40

ECM Regression
Case 3: Unrestricted Constant and no Trend

Variable	Coefficient	Std. Error	T-statistic	Prob.
C	**-84.86843**	**14.94118**	**-5.680168**	**0.0001**
D(POVR)	**0.450157**	**0.510779**	**0.881314**	**0.3942**
D(POVR(-1))	**-1.073818**	**0.515711**	**-2.082210**	**0.0576**
D(POVR(-2))	**1.828434**	**0.483340**	**3.782918**	**0.0023**
D(UNEMP(-1))	**-**	**0.150781**	**-2.717221**	**0.0176**

	0.409705			
D(EMPG(-2))	1.043869	0.282757	3.691756	0.0027
D(UNEMP(-3))	-0.415720	0.211412	-1.966396	0.0710
D(INQ)	0.896643	0.338269	2.650680	0.0200
D(INQ(-1))	3.349744	0.799710	4.188696	0.0011
D(INFL)	0.896847	0.221406	4.050694	0.0014
D(INFL(-1))	-1.131064	0.244261	-4.630549	0.0005
D(INFL(-2))	-0.752560	0.168948	-4.454382	0.0006
Cointeq(-1)*	-0.165567	0.029245	-5.661449	0.0001

R-squared	0.768909	mean dependent var	-0.385758
Adjusted R-Squared	0.565006	s.d. dependent var	7.552471
S.E. of Regression	4.981164	Akaike info criterion	6.355607
Sum Squared Resid	421.8040	Schwarz criterion	7.081187
Log-Likelihood	-88.86752	Hannan-Quinn criteria.	6.599743
F-Statistic	3.770945	Durbin-Watson stat	2.321042
Prob(F-Statistic)	0.005155		

* p-value incompatible with t-bounds distribution.

Having undergone the representation and conducting the Wald test, the result is reduced to the table below:

Table 5: Summary of the ARDL Result

ECM regression Case 3: unrestricted constant and no trend			
Variable	**Coefficient**	**S.E**	**P-Value**
UNEMP	0.834433	0.83443	0.0004
POVR $_{T-1}$	0.977535	0.604112	0.1296
INQ	-1.487908	0.612780	0.0304
INFL	1.503575	0.715992	0.0558
ECM(-1)	-0.165567	0.029245	0.0001

Table 5 above showed the calculated bound cointegration test where f lies above the upper level of the bound critical value (4.90 > 4.630) and is also greater than the lower bound of 3.276 at a 5% level of significance. This implies that there is long-run cointegration among the variables. However, the coefficient of 0.165567 ECM result, in the long run, shows an average of 17% speed of adjustment back from the short-run to the long-run equilibrium level. The positive nexus that exists between poverty and unemployment in the result is that; a unit increase in unemployment leads to a 98% increase in the poverty rate. This result complied with the study by Opafunso and Adepoju, (2014) with a positive and significant relationship between SMEs, employment generation, poverty reduction and living standards in Nigeria.

Based on Emmanuel and Willie's (2021) findings, an increase in employees' earnings will boost their purchasing power and hence their standard of living, thereby reducing the rate of poverty in Nigeria. Moreover, a unit change in INFL rate will lead to about 150% increase in poverty in Nigeria. This result is in line with Emmanuel and Willie, (2021) with a positive and significant impact on INFL and poverty in Nigeria. This result is reflected in the Nigerian economy with double-digit inflation and a high rate of poverty in 2021 of 33.3% where there is a high decline in GDP growth (NBS, 2021). Finally, the result shows that income inequality has a negative and significant relationship with the poverty rate. This means that a unit change in inequality leads to about a 148% decline in the poverty rate.

Causality Test

It is the aim of this study to determine the impact of income inequality on poverty level in Nigeria. In other words, is it income inequality that causes poverty in Nigeria? To do this, the Granger Causality Test was carried out between income inequality and poverty level in Nigeria. The expectation was that using Granger Causality Test, variable under consideration does not Granger Cause the other. The results of the Granger Causality is reported in Table 6 below.

Table 6 Granger Causality results

Pairwise Granger causality tests
Date: 04/16/23 Time: 16:53
Sample: 1981 2021
Lags: 2

Granger Causality	Obs	F-statistic	Prob.
POVR does not granger cause INFL	37	0.18190	0.8345
INFL does not granger cause POVR		0.46263	0.6338
UNEMP does not granger cause INFL	37	1.95737	0.1578
INFL does not granger cause UNEMP		1.13967	0.3326
INQ does not granger cause POVR	37	0.26232	0.7709
POVR does not granger cause INQ		0.19119	0.8269
UNEMP does not granger cause INQ	37	0.14230	0.8679
INQ does not granger cause UNEMP		1.15954	0.3265

Nb: * means rejection of the null hypothesis of non-granger causality.

Source: Author's Computation, E-views, 10.0, 2023

Please note: the Granger causality results presented above are designed only to show the causality results between the explanatory and endogenous variables.

The results in Table 6 show the Granger causality test between income and poverty rate in Nigeria. It is instructive to point out here that the cointegration test carried out earlier indicates the existence of a long-run relationship between variables but says nothing about the direction of the causal relationship. Execution of the Granger causality test makes it possible for us to determine the direction of the Granger causality. In the Granger causality approach, causality exists if the f-statistic is statistically significant given its associated probability value. Thus, in this study, causality is established up to a 5% level.

The results reported in Table 4.6 revealed the absence of bi-directional causality between income inequality and poverty rate. This means that causality does not run between the main researcher's variables and vice-versa.

Serial Correlation Test

The Lagrange multiple (lm) test is a diagnostics test used in identifying the presence or absence of serial correlation to prevent the model from spurious results.

Table 7 Breusch-Godfrey Serial Correlation lm Test

Breusch-Godfrey Serial Correlation lm Test:			
F-statistic	0.637390	prob. F(2, 20)	0.5391
Obs*r-squared	1.617833	prob. Chi-square(2)	0.4452

Source: Authors Computation Using E-views, 10.0, 2023

Table 7 shows that the f-statistic and obs*r-square values of 0.64 and 1.62 with p-values of 0.54 and 0.45 respectively indicate the absence of autocorrelation in the model since the f-statistic and obs*r-square with p-values of 0.54 and 0.45 are greater than the critical values at 5% level of significance. Thus, we can conclude that there is no presence of autocorrelation in the model.

Heteroscedasticity Test

This test is directed to check whether the variability of error terms is steady or not. The presence of heteroscedasticity signifies the instability of the residuals and could affect the inferences.

Table 8: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.181472	prob. F(4,22)	0.3463
Obs*r-squared	4.774357	prob. Chi-square(4)	0.3112
Scaled Explained ss	2.398449	prob. Chi-square(4)	0.6629

Source: Authors Computation Using E-views, 10.0, 2023

Table 8 above, shows that the f-statistic and obs*r-square values of 1.18 and 4.77 with p-values of 0.35 and 0.31 respectively indicate the absence of heteroskedasticity in the model since the f-statistic and obs*r-square with p-values of 0.35 and 0.31 are greater than the critical values at 1% level of significance. Thus, we can conclude that there is no presence of heteroskedasticity in the model.

4.2. Ramsey Reset Test

In statistics, the Ramsey regression equation specification error test (reset) test is a general specification test for the linear regression model. More specifically, it tests whether non-linear combinations for the fitted values help explain the response variables.

Table 9: Ramsey Reset Test

Equation: untitled

Specification: POVR UNEMP $POVT_{T-1}$ INQ INFL

Omitted variables: squares of fitted values

	Value	**Df**	**Probability**
T-statistic	2.075822	21	0.0504
F-statistic	4.309036	(1, 21)	0.0504
Likelihood ratio	5.039254	1	0.0248

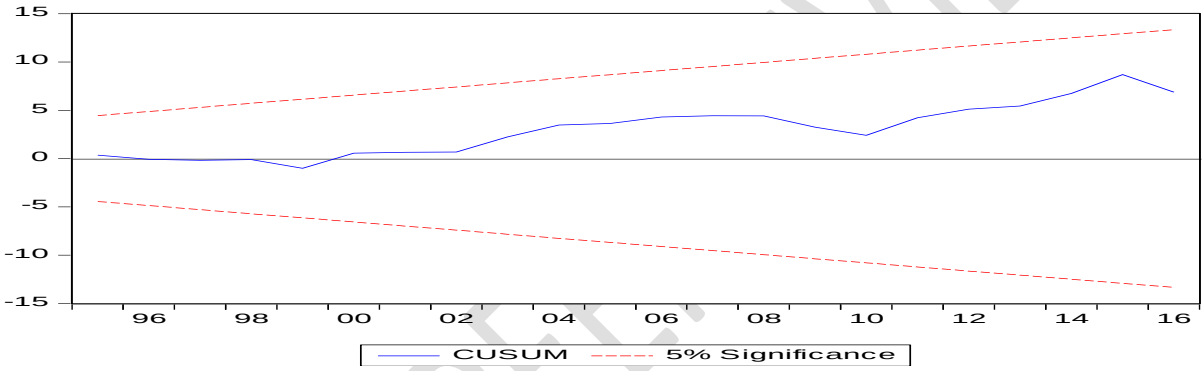
Source: Authors Computation Using E-views, 10.0, 2023

Table 9 above, shows that the f-statistic of 4.409036 with p-values of 0.0504 indicates that the model is correctly specified since the f-statistic with p-values of 0.0504 is greater than the critical values at p > 0.05 level of significance. We can conclude that there is no misspecification of the model and thus, the model was correctly specified.

4.3 Stability Tests

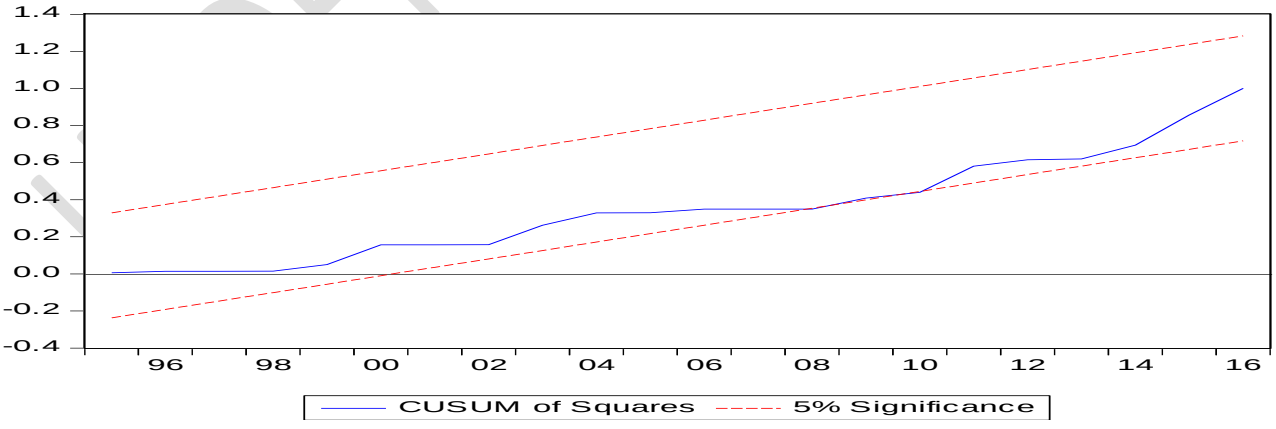
The cumulative sum (cusum) and cumulative sum of squares (cusumsq) are used to test the stability of the long-run coefficients alone with the short-run dynamics.

Fig. 1: Cumulative Sum (Cusum)



Source: Authors Computation Using E-views, 10.0, 2023

Fig. 2: cumulative sum of squares (Cusumsq)



Source: Authors Computation Using E-views, 10, 2023

In Figures 1 and 2 above, Cusum and Cusumsq are graphically shown. The statistics demonstrate the stability of the long-run coefficients of the repressors that affect inclusive growth in Nigeria because the plots of both the Cusum and the Cusumsq are within the borders. Given that none of the two test

statistics deviate from the limits of the 5% level of significance, the model looks to be stable and well-described.

5.0 Conclusion

Sequel to the results and the findings in this study, the following logical, coherent and sequential conclusions are made:

There is a long-run positive relationship between the employment rate and the Gini coefficient of income inequality in Nigeria. That is, the employment rate increases income inequality in Nigeria. There is a long-run positive relationship between the inflation rate and the Gini coefficient of income inequality in Nigeria, since, the inflation rate widens the gap between the rich and the poor. Also, the inflation rate reduces the purchasing power of income of the junior workers thereby widening the income gap in Nigeria. There is a long-run, inverse relationship between inequality and the Gini coefficient of income inequality in Nigeria. Inequality of income inequality increases the rate of poverty. This is premised on the fact that a large portion of income is concentrated in a few hands (about 3%) which makes the poverty rate to be high. The study also concluded that employment rate, inflation rate, and inequality are true determinants of income inequality in Nigeria. A negative coefficient of the over-parameterized ECM which shows that changes in the Gini coefficient of income inequality depend on changes in all the variables and also on the equilibrium error term further justifies the existence of the long-run relationship between income inequality and its determinants.

From the empirical findings in this research work and based on the relationship each determinant of income exhibited with the Gini coefficient of income inequality in Nigeria's economy, the following recommendations are made to enhance a more evenly distribution of income which would in effect, reduce income gap and poverty in Nigeria. Efforts of the government should be mobilized towards the formulation and implementation of more pragmatic employment policies in Nigeria. Since the empirical findings in this research work have shown that a rise in the employment rate has not been sufficient to reduce inequality of income inequality in Nigeria. A more pragmatic employment policy would enable workers to create wealth from their income (and not just for sustenance) which enhances a more evenly distributed income. If the efforts of the Nigerian government on wage increase are going to yield more positive results, then, a policy to reduce the current inflation rate of 2-digits to 1-digit must be prioritized. A considerable rate of inflation would help increase the real value of income in the hand of workers especially the low-income earners thereby closing the gap between the rich and the poor. Our findings in this empirical work indicated that a rise in the inflation rate widens the income gap in Nigeria, therefore, simultaneous policies for wage increase and that which controls the growth rate of inflation should be given more priority in Nigeria. In addition to higher growth rates, development policies that address severe and pervasive income inequality must be implemented to lift people out of poverty. Examples of such policies include better distribution of human capital, well-targeted social protection, better distribution of socio-economic amenities like roads, electricity, schools, and hospitals, more progressive taxation, and implementation of the increased minimum wage and a set of

policies designed to bring about a more equitable distribution of income, equal access to education and associated income earning opportunities should be given priority in Nigeria.

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DATA

Table 10. Data for regression

Year	Pov (%)	Gini (%)	Infl (%)	Unempl (%)
1980	40.20	36.2	10.0	3.791
1981	41.88	36.7	20.8	3.841
1982	41.96	37.2	7.7	4.102
1983	43.08	37.7	23.2	4.321
1984	44.06	38.2	17.8	4.239
1985	45.3	38.7	7.4	4.21
1986	46.3	39.2	5.7	4.223
1987	47.3	39.7	11.765	4.243
1988	48.3	40.2	34.24	4.273
1989	49.3	40.7	49.02	3.951
1990	50.3	41.2	7.8	3.974
1991	51.3	41.7	12.195	3.562
1992	57.3	45.0	44.565	3.562
1993	54.76	46.9	57.14	3.826
1994	55.9	47.02	57.42	4.016
1995	57.1	47.73	72.73	3.947
1996	63.5	51.9	29.29	3.951
1997	60.6	52.1	10.67	3.974
1998	61.9	53.5	7.86	3.992
1999	63.1	55.0	6.62	4.009
2000	64.4	56.0	6.94	3.954
2001	65.7	53.2	18.87	4.029
2002	66.9	45.08	12.88	4.11
2003	63.5	40.1	14.03	4.063
2004	53.3	40.06	15.00	3.98
2005	53.02	40.72	17.86	3.87
2006	53.12	41.74	8.22	3.666
2007	52.99	41.89	5.42	3.439
2008	53.6	42.9	11.58	3.424

2009	53.5	43.0	11.54	3.757
2010	54.43	43.9	13.72	3.77
2011	54.9	44.5	10.80	3.697
2012	55.01	45.1	12.20	3.693
2013	55.21	45.7	8.5	3.703
2014	55.9	46.3	8.1	4.437
2015	55.8	46.9	9.60	5.313
2016	57.2	47.5	15.68	6.237
2017	61.2	39.0	16.52	6.013
2018	40.1	35.1	12.09	6.026
2019	40.1	35.1	11.40	9.032
2020	42.0	42.7	13.25	33.3
2021	62.6	40.9	16.95	35.0

Source: CBN Statistical Bulletin, 2021 and WDI, 2022.