

Income Inequality and Economic Growth Nexus in Nigeria: A Nonlinear Autoregressive Distributed Lag Model Approach

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Abstract:- Nigeria's economy is expanding, and the country has the human capital and economic resources to lift millions out of poverty. Despite being Africa's largest economy, economic inequality and its attendant economic implications have reached alarming proportions. Against this context, the study investigated the impact of income inequality on Nigerian economic growth. It used secondary time series data spanning the years 1980 to 2022. The data set was initially checked for stationarity using the Augmented Dickey Fuller (ADF) test. In addition, the research method used Bound test approach for examining long-run and short-run asymmetry effects using Nonlinear Autoregressive Distributed Lag Model (NARDL). The NARDL Bound test verified that the variables in the research had a long-run connection. It also demonstrated that the calculated model correctly captures asymmetries in the responses of the economic growth (GDPR) to changes in positive and negative income inequality. The positive changes to income inequality indicated an increasing but not significant effect on economic growth while negative changes to income inequality indicated an increasing and significant effect on economic growth in the long-run. On bases of these findings, the study recommended for government and the private sector to step-up measure for income redistribution through directly investing in opportunities for the poor to boost their capacity in generating income. Among such measures includes; providing access for micro-credit facilities, prioritizing investment in functional education and training as well as healthcare facilities and making it accessible to the people to increase the capacity of the human capital for sustainable economic growth.

Keywords:- Income Inequality, Economic Growth and NARDL Model.

I. INTRODUCTION

Inequality is one of the most frequent concerns in both emerging and established economies worldwide. Income disparity does not exist merely as a measurement of uneven wealth distribution; it also has societal implications as an example for public policy, economic growth and

institutional quality. It's the disparity in terms of income distribution between the affluent as well as the poverty-stricken. The wealthiest received most, whereas the impoverished got the least. The World Inequality Report claims (WIR) (2022), the wealthiest 10% population globally presently obtains 52% of worldwide revenue, whereas lowest 50% only have 8.4%, an indication of vast majority in the planet been impoverished. There are about 4 billion people in the planet which live with a daily income of less \$6.70 (Roser & Hasell, 2022). Low-income people, according to researchers in Global Economic Inequality (2018) may anticipate earnings grow of 4,000 dollars approximately till 2035. According to data, global economy expanded by roughly 14% during the previous five years (World Bank, 2022).

As the world repositions itself to reach 2030 Leave No One Behind Sustainable Development Goal (SDG) of the United Nations, the need to address economic disparity in Nigeria has received more emphasis. Inequality reduction may result in enhanced and sustained economic development, social cohesiveness progress and coexisting in peace. Recognizing that disparity in income may be a drag on economic growth and development, the Nigerian government has taken many steps to address the issue. Over the years, government embarked on programmes and policies to curtail disparity in income among the citizenry. These includes; Agricultural Credit Guarantee Scheme (ACGS), Low-Cost Housing, Rural Electrification Scheme (RES), National Directorate of Employment (NDE), Family Support programs (FSP), National Poverty Eradication Programme (NAPEP), Conditional Cash Transfer Program (CCTP), N-Power and subsidy reinvestment programme (Sure-P) among others (Kolawole, 2021).

Despite the implementation of these initiatives, the prevalence of inequality in Nigeria remained on increased, with the Gini coefficient (an indicator of inequality) rising approximately 38.7% in 1980 to 49.6% in 2017. Nigeria had a 35.1 Gini grade in the nations' Gini coefficient for 2022. With this score, Nigeria is ranked 100th globally and 11th in West Africa out of 163 countries. Inequality of income in Nigeria ranges 1 through 14 for the top 10% towards the bottom 50% of the people while for the top 1%

to the lowest 50%, from 1 to 37. (WIR, 2022). Simply put, the income of one individual in the top 10% of the population supports 14 persons in the lowest 50% of the population. The nation's score on the index took into account 33.28% people without jobs and a 40.09% the number of people living in poverty at the end of 2020 (WIR, 2022).

No doubt, the recent decade has been difficult for Nigerians, having an average output growth rate of 1.1 percent and two economic recessions. In 2022, the combined rate of unemployment and underemployment was 56.1%, which plunged 133 million Nigerians into multidimensional poverty. Similar to this, economic growth has not been equitable, and Nigeria's economy has encountered significant difficulties including reduced productivity and slow sector expansion with high employment elasticity (World Bank, 2022). These latest studies on the state of economic development indices in Nigeria are concerning.

To establish the nexus between disparity in income and economic growth is hotly contested among policymakers and scholars in both developed and developing nations in recent years, since it has expanded considerably (Dossou, Ndomandji, Kambaye, Bekun, & Eoulam 2021). Rising income disparity, according to Shi, Paul, and Paramati (2020) and Dossou, Kambaye, Berhe, and Alinsato (2023), might stifle economic growth. Similarly, large levels of income disparity can lead to political instability, which can slow development. Likewise Ajide and Alim (2021) believe rising wealth disparity will have a detrimental impact on educational investment, which will exacerbate terrorism and impede economic progress. Poverty and economic inequality are closely related in Africa, claim Folarin and Adeniyi (2019). In the same vein, Evidence from Zhao and Xia (2020), Zhao (2020), and Dossou et al. (2021) showed that income inequality worsens poverty in China and Latin America, respectively. Given the disparate results on the Nigeria's economic growth and income disparity, which primarily focused on the linear or symmetry effect, the purpose of this study is to look at the asymmetric effects of income inequality on economic growth. It introduces nonlinearities in the short and long term by using positive and negative partial sum decompositions of the income inequality variable and examines its overall effect.

II. REVIEWS OF LITERATURE AND THEORETICAL FRAMEWORK

➤ *Conceptual Clarification*

Here the researcher identifies various schools of thought held by scholars, authors and organizations with respect to the concept of income inequality, economic growth, poverty rate as well as human capital development.

➤ *Income Inequality*

Concept Inequality is a crucial notion for social equity theorists. However, because it might signify different things to different people, it is prone to ambiguity in public debate. Income inequality, according to Omolua and Tamunowariye (2021), is the unequal distribution of income among the

people. According to the IMF (2022), inequality can be seen from many different perspectives, all of which are related. Income inequality, which measures how evenly income is distributed throughout a population, is the most common metric. Income disparity throughout a person's lifetime, or lifetime inequality, the distribution of wealth among families or people at a certain moment known as inequality of wealth as well as opportunity Inequality (effects on income of factors over which people have little control, including family socioeconomic position, gender, or ethnic origin) are all related concepts. Income inequality may thus be characterized for the study as discrepancy in the distribution of income across people, groups, populations, or social classes within the country. The Gini co-efficient is used to quantify income distribution across a population as an indicator of economic inequality.

➤ *Economic Growth*

Concept of economic growth also conveys different meaning to different school of thought at different levels According to Kuznets (2019), economic growth is an increase over time in a country's ability to offer its citizens a wider range of economic advantages. The growing capacity is a result of technological development and the institutional and ideological adjustments it necessitates. The definition's three components are all significant. Kimberly (2017) defines economic growth as an increase in output of goods and services over a given time span. It denotes sectoral expansion in the sense that goods' productivity levels are steadily raising, which has an influence on national income, employment, and consumption, among other things. To be precise, the measurement must account for the impacts of inflation.

➤ *Poverty*

James (2023) defines poverty as the condition or situation in which individuals, groups, or communities lack the resources and essentials for a subsistence level of existence. Their basic human needs are not met as a result. Families and individuals living in poverty may not have access to proper housing, clean water, wholesome food, or medical care. According to Samson (2023), poverty is a state in which a person lacks access to basic essentials including food, clothing, and shelter. It is about more than simply money; it is also about marginalization, exclusion, and local and international economic indices. In this study, poverty is defined as the ratio of working-age people whose income is below the poverty line divided by the median household income for the entire population, or the poverty rate in Nigeria.

➤ *Human Capital Development*

The development of human capital, according to Word Bank (2018), is the accumulation of knowledge, skills, and health during a person's lifetime that enables them to reach their full potential as contributing members of society. We can end extreme poverty and create more fair societies by investing in human capital. The Human Capital Index evaluates how health and education will affect worker productivity in the future.. According to Dheeral (2023), human capital development is the collection of skills,

abilities, and other traits that people have that contribute to their production; it represents the untapped potential for productivity of people. In contemporary literature, human capital is quantified using costs, income, education, and health. The creation of new designs and ideas is directly attributable to human capital, which is represented by the accumulation of scientific knowledge. In accordance with the aforementioned, the Human Development Index (HDI), a summary evaluation of average achievement in significant areas of human development, was utilized in the study.

➤ *Theoretical Review*

The research was founded on Kuznets' theory of economic growth, which established linkages between poverty, inequality, and economic growth. Simon Kuznets, a Russian-American economist, proposed this hypothesis in 1955. The idea is that a curve with an inverted U form connects inequality and growth. When individuals move from the large, relatively poor, and egalitarian agricultural sector to the small, industrial sector, which is wealthier but more unequal, inequality increases throughout the early stages of economic expansion. However, as more people move to metropolitan areas, the relative salaries of lower-paid workers in both urban and rural areas increase, and various government programs are implemented to reduce intra- and inter-sectoral inequality. As a result, the economy's overall income disparity decreases throughout the latter stages of growth. One implication of the Kuznets theory is that it may take a long time to eradicate poverty in developing nations if early stages of economic progress result in rising inequality.

➤ *Empirical Review*

An empirical study carried out in Nigeria by Chinonye (2022) demonstrated that income disparity has an inverse relationship with the country's economic growth, but poverty has a positive impact on economic growth. Similarly, it finds that poverty and income disparity had an insignificant impact on Nigeria's economic growth. The methodologies employed by the study were ADF test for stationarity test, cointegration test for long-run relationship and ECM for short run dynamic analysis using annual secondary data spanning 1981 to 2019 which were sourced from NBS and CBN statistical bulletins.

Similarly, Victoria and Macdonald (2021) investigated the influence of wealth disparity on Nigerian economic development from 1989 to 2020. The study employed a quantitative research strategy that included the use of secondary data gathering methods. Multiple linear regressions were used to examine the acquired data. The study found that income inequality and poverty indicated an inverse and substantial relationship with economic growth in Nigeria, but the inflation rate has a negative but small impact.

In a related development, Ade-omonijo in (2021) carried out a study investigating the cause effect relationship between income inequality, income, poverty and economic growth in Nigeria. Secondary data from yearly time series were used in this investigation. WDI (2020), CBN and NBS

(2020) bulletin as well as Kneoma (2020) were used as sources of data. The acquired data was analyzed using econometric approaches, namely the ARDL Bound test for long-run analysis and Phillip and Perron (PP) test for unit root test as well as the lag order of the ARDL models utilizing VAR lag selection criteria. It was established that, income inequality and poverty have inverse but insignificant influence on Nigeria's economic growth.

Furthermore, Omolua and Tamunowariye (2021) investigated the impact of poverty as well as income inequality on Nigerian output growth from 1985 to 2020. Secondary sources for yearly time series data on our target variables were the CBN as well as WDI statistical bulletin (different years). ARDL method was used to evaluate the data and according to the ARDL calculations, the Gini coefficient (income inequality indicator) and the inflation rate coefficient show negative impact on RGDP but poverty rate coefficient has a positive impact on RGDP.

Ebrima, Momodou, and Tsenkwo (2019) use panel data analysis to empirically assess impact of income disparity on GDP in selected Western African countries from 1969 and 2016. The panel data technique results show that poverty has increasing and significant impact to GDP, inequality and human capital indicated a reducing and significant impact to GDP.

Ibekwe and Ibekwe (2022) also evaluated the impact of wealth disparity on Nigerian economic development from 1981 to 2021. ADF unit root test, Ordinary least squares (OLS) approach of data analysis and ECM were employed for data analysis of the study while data were sourced from CBN Statistical Bulletin. It was discovered that; income inequality shows positive but no significant impact on Nigerian GDP while poverty shows inverse and significant impact on Nigerian GDP for the period of the study.

Furthermore, a study conducted to ascertain impact of income inequality on GDP by Manyeki and Balázs (2020) utilizing an ARDL and secondary data ranges 1990 and 2015 discovered a positive but insignificant long-run impact of income inequality on GDP while positive and significant impact of income inequality on GDP in the short-run.

Muhammad-Bashir as well as Lawal (2022) examined the relationship between globalization, GDP as well as wealth disparity for Nigerian economy. The study employed yearly series data obtained from CBN Statistical Bulletin spanning 1986 and 2019. The ARDL (Auto-Regressive Distributed Lag) Technique was used expressly to analysed the study. Furthermore, Lorenz curve was used to assess the extent of inequality (disparity) in Nigeria (before SAP, after SAP, and Democratic Rule). According to the ARDL evaluation, globalization has an inverse but significant relationship with Nigerian GDP. Furthermore, the Lorenz curve demonstrated that Nigeria's inequality has been progressively increasing over time.

III. METHODOLOGY

The study adopted causal-comparative research design because it established the cause-effect relationship between income inequality and GDP in Nigeria. The study used time series secondary data sourced from WDI data base and NBS statistical bulletins spanning the period of 1980 and 2022. The study employed statistical and econometric methods for data presentation and analysis. The statistical methods employed include; tables, graphs and mean while the econometrics methods include; ADF for stationary test as well as NARDL model estimated within the ARDL framework to capture asymmetric effects. The model used

for this study followed Chinonye (2022) empirical model in line with the Kuznet theoretical underpinnings. This study formulates NARDL models to establish the asymmetry effect of income inequality on GDP in Nigeria. Based on objective and data nature required, Rate of GDP (GDPR) is proxy as economic growth and served as dependent variables. Gini coefficient proxy for income inequality, poverty Index population growth rate and Human Capital Development Index represent independent variables in the model.

➤ *Functional Relationship Model is Specified thus:*

$$GDPR = f(INEQ, POVR, POPR, HDI) \dots\dots\dots(1)$$

• *Equation (1) is Stated in Mathematical form below;*

$$GDPR_t = \beta_0 + \beta_1 INEQ_t + \beta_2 POVR_t + \beta_3 POPR_t + \beta_4 HDI_t \dots\dots\dots(2)$$

However, equation (2) is precise or deterministic. To accommodate for the inexact connection between variables, as in the case of most economic variables, and describe it in econometric form, the stochastic error term "ε" is introduced to equation (2), provided that other factors not in the model may impact the dependent variables. Equation (2) is restated in econometric form as follows:

$$GDPR_t = \beta_0 + \beta_1 INEQ_t + \beta_2 POVR_t + \beta_3 POPR_t + \beta_4 HDI_t + \epsilon \dots\dots\dots(3)$$

Equation (3) is restated in unrestricted linear ARDL

$$\Delta((GDPR_{t-1})) = \beta_0 + \beta_1((GDPR_{t-1})) + \beta_2((INEQ_{t-1})) + \beta_3((POVR_{t-1})) + \beta_4((POPR_{t-1})) + \beta_5(HDI_{t-1}) + \epsilon_t \dots\dots\dots(4)$$

Where;

- ✓ GDPR = Economic Growth
- ✓ INEQ = Gini coefficient (Proxy for Income Inequality)
- ✓ POVR = National Poverty Index
- ✓ POPR = Population Growth Rate
- ✓ HDI = Human Development Index (Proxy for Human Capital Development)
- ✓ β₀ = Intercept
- ✓ β₁ – β₅ = Parameter Estimates
- ✓ ε_t = Error Term

• *The NARDL Model Decomposing Income Inequality into its INEQ⁺ and INEQ⁻ Partial Sum is Stated as thus;*

$$(INEQ_t^+) = \sum_{i=1}^t \Delta(INEQ_t^+) = \sum_{i=1}^t MAX(\Delta INEQ_i, 0) \dots\dots\dots(5)$$

$$(INEQ_t^-) = \sum_{i=1}^t \Delta(INEQ_t^-) = \sum_{i=1}^t MIX(\Delta INEQ_i, 0) \dots\dots\dots(6)$$

Where INEQ⁺ and INEQ⁻ are the total of the positive (or raises) and negative (or lowers) effects on income inequality. Equation (4) can be amended as follows to reflect an asymmetry level relationship:

$$\Delta(GDPR_t) = \rho_0 + \rho_1(GDPR_{t-1}) + \rho_2(INEQ_{t-1}^+) + \rho_3(INEQ_{t-1}^-) + \rho_4((POVR_{t-1})) + \rho_5(POPR_{t-1}) + \rho_6(HDI_{t-1}) + \sum_{i=1}^p \gamma_1 \Delta(GDPR_{t-1}) + \sum_{i=1}^q \gamma_2 \Delta(INEQ_{t-1}^+) + \sum_{i=1}^q \gamma_3 \Delta(INEQ_{t-1}^-) + \sum_{i=1}^r \gamma_4 \Delta((POVR_{t-1})) + \sum_{i=1}^r \gamma_5 \Delta(POPR_{t-1}) + \sum_{i=1}^s \gamma_6 \Delta(HDI_{t-1}) + \epsilon_t \dots\dots\dots(7)$$

Where; all variables continue to be specified as in equation (4). The positive and negative lags of income inequality are decomposed into the partial sums of the positive and negative effect (INEQ⁺ and INEQ⁻). The variables' lag orders are indicated by the letters p and q, respectively. The p denotes the lag order of positive partial,

whereas the q denotes the lag order of negative partial sum income inequality. Equation 7's first section demonstrates the long-term link between income disparity and economic growth, while its second section focuses on the corresponding short-term relationship.

IV. EMPIRICAL FINDINGS

➤ *ADF Test Result*

To eliminate illogical regression estimates that might lead to erroneous conclusions, the data were submitted to a unit root test to determine the data series' stationarity. Table 1 displays the results of the Augmented Dickey-Fuller (ADF) test.

Table 1 ADF Statistics of the Variable

Variables	Test Statistics for ADF	Critical Value at 1%	Critical Value at 5%	Critical Value at 10%	P-Value	I(d)
GDPR	-12.08960	-3.600987	-2.935001	-2.605836	0.0000	I(1)
POPR	-4.354598	-3.639407	-2.951125	-2.614300	0.0016	I(0)
INEQ	-3.073862	-3.605593	-2.936942	-2.606857	0.0367	I(1)
HDI	-4.702210	-3.600987	-2.935001	-2.605836	0.0005	I(1)
POVR	-7.083627	-3.600987	-2.935001	-2.605836	0.0000	I(0)

Source: Extracts from E-Views 9.0, 2023

The Table 1 shows most time series data for the variables to stationary first difference with exception of population growth rate which happens to be stationary at level. This condition warrants the application of NARDL methods which accommodates series that are either stationary first difference or stationary at level or both. The stationarity tests are necessary to guard against spurious regression and to ensure no series is stationary at second difference. The Akaike Information Criterion (AIC), which was selected automatically served as the basis for the test.

➤ *Analysis of NARDL*

Crucial tests and analyses including; NARDL optimal lag selection test, Bound test and model estimations for long and short run coefficients are carried out and demonstrated.

➤ *Model Lag Selection for NARDL*

The choice of lag length is sensitive as it provides maximum lags assigned and NARDL provided AIC for the optimal lag that provided efficient and unbiased coefficients. The estimated of NARDL optimal lag is presented and interpreted. The AIC graph for optimal lag summary is presented as figure 1.

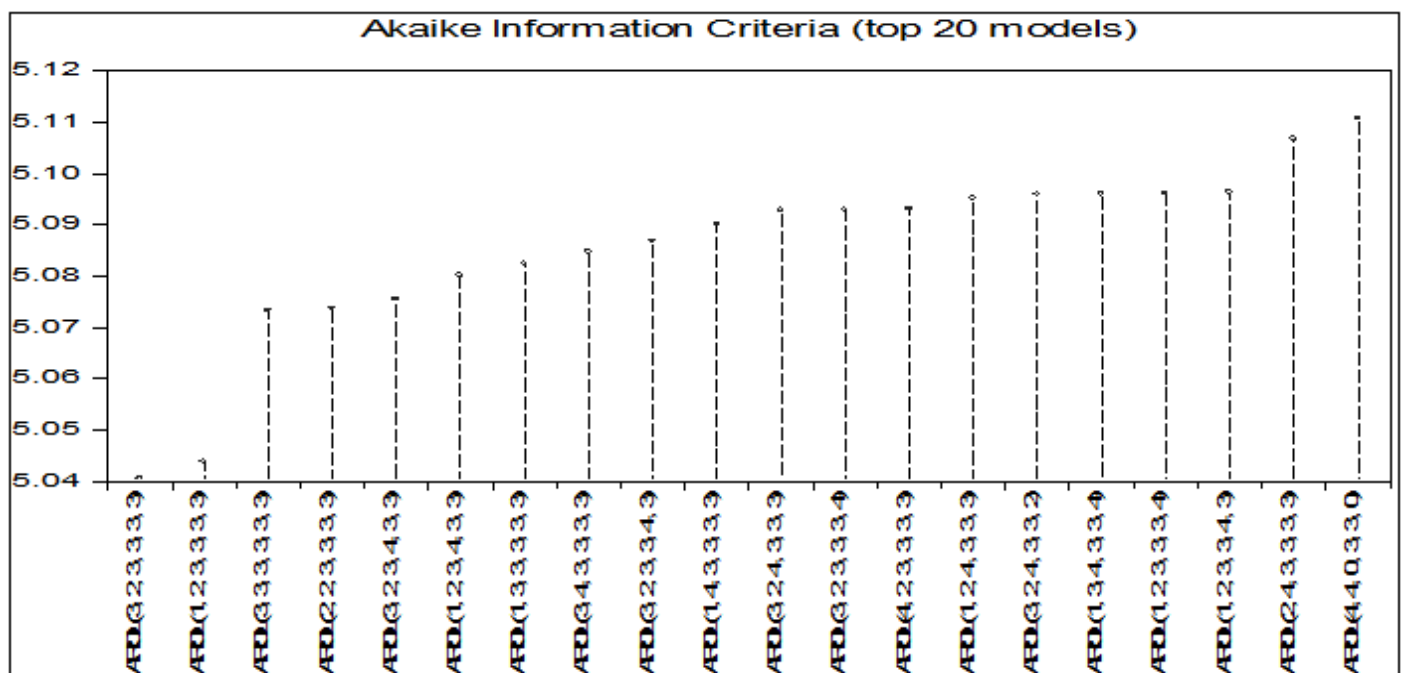


Fig 1 Graph Showing Optimal lag Model Selection Summary

Source: Extraction from E-Views 9.0, 2023

Figure 1 show the top 20 NARDL model specifications that were considered for the model. Although a NARDL 3, 2, 3, 3, 3, 3 were randomly chosen. However, in terms of lowering AIC, it can also be observe how well some other criteria did.

➤ *NARDL Bound Test*

To determine if there is a long-term link between economic growth, income inequality, poverty rate, population expansion, and human capital development, the NARDL Bound test adapted inside the ARDL framework was conducted. Result for NARDL Bound test is shown in Table 2 as thus;

Table 2 NARDL Bound Test

Test Statistic	Value	K
F-Statistic	5.346693	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Source: Extracts from E-Views 9.0, 2023

The findings in Table 2 show that the estimated model's F statistic value above the Pesaran crucial values of 5% level of significance. This means that there is a long-term link between the variables and that the null hypothesis that "no long-run relationship exists" is rejected.

➤ *NARDL Long-Run Coefficients*

After confirming that there is a long-term link between the variables, the NARDL long-run coefficients were computed to investigate the long-term impact of the independent factors on the endogenous variable. Table 3 displays the expected outcome of the NARDL long-run coefficients.

Table 3 NARDL Long-Run Coefficients

Variables	Coefficient	Std. Error	t-Statistic	Prob.
INEQ_POS	0.1551035	0.1755358	0.883600	0.32900
INEQ_NEG	0.1111051	0.1062699	1.045499	0.03130
POPR	0.5522910	3.3255042	1.660774	0.01162
HDI	-0.1508221	5.3848193	-0.280087	0.07830
POVR	-0.1851517	015438001	-1.199323	0.02479
C	0.23874214	15.5804150	1.532322	0.01450

Source: Extracts from E-Views 9.0

Table 3 reveals that, the estimated model shows that, INEQ_POS, INEQ_NEG and POPR affect GDPGR positively while HDI and POVR affect GDPGR negatively. In other words, as INEQ_POS, INEQ_NEG and POPR increases by say 1%, GDPGR is also expected to increase approximately by 16%, 11% and 55% respectively. However, 1% increase in HDI and POVR reduce GDPGR approximately by 15% and 19% respectively. The result further reveals that, INEQ_NEG, POPR and POVR conform to a priori expectation base on economic theory. On the contrary, INEQ_POS and HDI do not conform to a priori expectation. Additionally, it was discovered that the p values of INEQ_NEG, POPR, and POVR are statistically distinct from zero under the null hypothesis that the real population value of each regression coefficient separately is zero. The p values for INEQ_POS and HDI, on the other hand, are not statistically different from zero. This suggests that the variables' chances of having a t-value or above are statistically unlikely.

The estimated model's results also imply that the NARDL model effectively represents asymmetries in how the GDPGR responds to changes in income inequality. Positive changes in income inequality (INEQ_POS) elicit a larger reaction than negative changes (INEQ_NEG). The calculated model's long-run coefficient values, which demonstrate that the positive change in income equality (INEQ_POS) has a coefficient of 0.1551035 and the negative change in income inequality (INEQ_NEG) has a coefficient of 0.1111051 or less, show this to be the case. This is equivalent to a difference of around 4%. The intercept (C) value of 0.23874214 means that if the value for all the variables include in the model were set to zero, the typical amount of GDPGR for the economy will increase approximately to 24%.

➤ *NARDL Short-Run Form*

The study further ascertains the calculated model's short-run dynamics, which have long-term relationships and effects of exogenous factors on endogenous variables established. The short-run NARDL coefficients are shown as thus in table 4.

Table 4 Estimated Model's NARDL Short-Run Dynamics

Variables	Coefficients	Std. Error	t-Stat.	P-Values
D(GPDR(-1))	-0.229038	0.336410	-0.680830	0.5057
D(GPDR(-2))	-0.067650	0.239121	-0.282911	0.7809
D(INEQ_POS)	-0.126105	0.085003	-1.483590	0.1573
D(INEQ_POS(-1))	-0.243957	0.118548	-2.057875	0.0563
D(INEQ_NEG)	-0.450920	0.283281	-1.591776	0.1310
D(INEQ_NEG(-1))	-0.388474	0.912127	-0.425899	0.6759

D(INEQ_NEG(-2))	-0.137721	0.073316	-1.878443	0.0787
D(POPR)	0.865820	1.947904	0.444488	0.6626
D(POPR(-1))	-0.375652	0.351288	-1.069356	0.3008
D(POPR(-2))	0.172094	0.114828	1.498707	0.1534
D(HDI)	-0.786295	0.547780	-1.435422	0.1704
D(HDI(-1))	-0.687514	0.605488	-1.135471	0.2729
D(HDI(-2))	0.731773	0.597574	1.224573	0.2385
D(POVR)	-0.221241	0.656592	-0.336954	0.7405
D(POVR(-1))	0.787246	0.552881	1.423899	0.1737
D(POVR(-2))	0.829441	0.453130	1.830468	0.0859
CointEq(-1)	-0.102227	0.037323	-2.739001	0.0146

Source: Extracts from E-Views 9.0, 2023

Table 4 shows the NARDL short run coefficients which provided short-run dynamics of the asymmetric impact of income inequality and other explanatory variables on GDP for study period. It reveals that; real level of 1 year lagged, 2 year lagged of GDPR has negative but not significant effect on current year GDPR.

Similarly, the values for the coefficients of current year INEQ_POS and 1 year lagged INEQ_POS (-1) affect GDPR negatively, though coefficients are not significant. In same vein, coefficients for current year INEQ_NEG, 1 year lagged INEQ_NEG (-1) and 2 year lagged INEQ_NEG (-2) indicated negative but not significant effect on GDPR.

Contrary, values of the current year POPR and 2 year lagged POPR (-2) revealed positive but not significant effect on GDPR. However, 1 year lagged POPR (-1) shows negative and significant effect on GDPR within the period.

In related development, values of the coefficients for current year HDI and 1 year lagged HDI(-1) indicated negative but not significant effect on GDPR while 2 year

lagged coefficient indicated positive and not significant effect on GDPR for the period in the economy.

In addition, the value of coefficient for current year POVR has shown negative effect on GDPR while coefficients for 1 year lagged POVR (-1) and 2 year lagged POVR (-2) have shown positive effect on GDPR. The coefficients for the POVR have shown not to be significant.

The estimated co-integration term (CointEq(-1)) fulfills the presumption and is statistically significant. The size of the co-integration term suggests that, in the event of any departure, the long-run equilibrium is quickly corrected, with a potential for removing 10% of the disequilibrium every period. This demonstrates that even in the presence of an initial state of disequilibrium, economic growth will equilibrate at a rate of 10%.

➤ *Post Estimation Tests*

The calculated model underwent tests for normality, serial correlation, heteroscedasticity, model misspecification, and stability. Results for residual diagnoses are presented in table 6 and figures 2.

Table 6 Residual Tests

Test	Null Hypothesis	F-statistics	Prob. Value
Jarque-Bera (JB)Test	Series residuals are normally distributed	5.112529	0.077594
Beusch Godfrey Serial Correlation LM Test	No Serial Autocorrelation	3.225691	0.0704
Breusch-Pagan Godfrey	No Heteroscedasticity	0.855810	0.6393
Ramsey Reset	No Misspecification	3.176138	0.0950

Source: Extracts from E-Views 9.0, 2023

Table 6 indicated the result JB statistic which reveals that, the series residuals' normal distribution is accepted as the null hypothesis because the p-value is significant at a level larger than 5%. Similarly, Breusch-Godfrey Serial Correlation LM Test results for the estimated model show that the null hypothesis of no serial correlation is accepted since the estimated models' F-statistic probability values are significant at the 5% level. Similar to this, the Breusch-Pagan-Godfrey heteroscedasticity test demonstrates that the null hypothesis that the estimated model's disturbance components reflect the equal variance assumption of homoscedasticity is accepted. This is because the probability of F-statistic is significant at 5% level. Additionally, the F-statistic for the estimated model is significant at the 5% level, indicating that the null hypothesis that the model contains no omitted variables is accepted. This is shown by

the estimated result of the Ramsey RESET Test for model specification.

Additionally, the NARDL CUSUM test was performed to check for parameter stability. Based on the cumulative sum of the recursive residuals, the NARDL CUSUM adopted. In this case, the cumulative total and the 5% crucial lines are plotted simultaneously. If the cumulative total leaves the region between the two critical lines, the test finds parameter instability. A pair of 5% significance lines, whose distance grows with the number of subsamples, are used to evaluate the importance of any deviation from the zero line. The NARDL CUSUM tests for the estimated model are displayed in Figures 2.

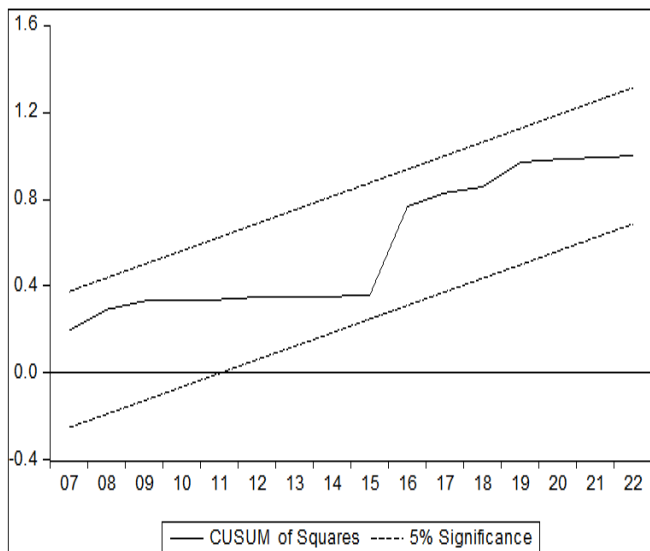


Fig 2 CUSUM test of the Estimated Model
Source: Extracts From E-Views 9.0, 2023

Movement of the recursive residuals inside the crucial lines is indicative of the stability of the coefficients. The recursive residuals' cumulative total demonstrates that the equation is stable across the sample time.

V. DISCUSSION

The NARDL Bound tests of Co integration reveal long-run relationships for GDP, INEQ, POPR and POVR for study period. The implication is that, income inequality has long-run influence in the determination of the performances of GDP for the economy. The result is in tune with Chinonye (2022), as well as Victoria and Macdonald (2021) who also confirmed this for the economy.

The study divided income inequality into its positive and negative effects and accounted for each one's unique impact on economic growth as it moved toward the addition to the body of knowledge and placed more attention on the main factors. The estimated NARDL model's output effectively reflects asymmetries in how the rate of economic growth responds to variations in income inequality. The result shows that, positive response in income inequality has positive effect on GDP though not significant for the economy. The finding is at variance with studies by Chinonye (2022), Victoria and Macdonald (2021), Adeomonijo (2021), Omolua and Tamunowariye (2021) as well as Ebrima, Momodou and Tsenkwo (2019) who confirmed that, INEQ shows inverse relationship with GDP for Nigerian economy. However, the finding conformed to similar study by Ibekwe and Ibekwe (2022), Manyeki and Balázs (2020) as well as Danso and Boateng (2020) who demonstrated that INEQ shows positive impact GDP for Nigerian economy.

In a similar development, finding revealed that, negative response in INEQ demonstrated positive and significant impact on GDP for the economy. The finding corroborate with similar studies by Ibekwe and Ibekwe (2022), Manyeki and Balázs (2020) who demonstrated that

also for the economy. The finding disagreed with studies by Chinonye (2022), Victoria and Macdonald (2021), Adeomonijo (2021), Omolua and Tamunowariye (2021) as well as Ebrima, Momodou and Tsenkwo (2019) who confirmed otherwise for the economy.

The outcome of the study on the impact of income inequality on economic growth clearly showed that gap in income between the affluent and the poor had no long-term, significant negative impact on economic growth in Nigeria. This is because low income levels associated with favorable responses to income inequality tend to increase investments in physical capital, whereas income levels associated with unfavorable responses to income inequality tend to increase investments in human capital, which becomes more valuable than physical capital as income levels increase, and inequality tends to impede economic growth by affecting human capital accumulation. The results revealed a U-shaped inverted relationship between income disparity and economic development in Nigeria.

In the same vein, finding revealed that, POPR has positive and significant impact on GDP for the economy. This suggests increase in population growth rate increase GDP given credence to population growth for the economy. This corroborates with Olusogo, Oluwarotimi and Muazu (2018) as well as Adeteki (2019) who equally confirmed positive impact of population growth on the economy.

On the contrary the empirical discovered HCD to exhibit negative though insignificant impact on GDP for the Nigeria economy. It however, negates a priori expectation. The implication of the finding for the economy is that, various efforts of government to develop the human capital is yielding the desired result in respect to economic growth possibly due of the widespread corruption that dominated the Nigerian economy making it impossible to properly channel resources for effective human capital development that propel economic growth for the economy. The finding is in conformity with study by Ebrima, Momodou and Tsenkwo (2019) who also discovered that, human capital development demonstrated inverse and insignificant relationship with GDP in Nigeria.

Similarly, the empirical study established that, national poverty index indicated inverse and significant impact on GDP in Nigeria. This demonstrated poverty index depleting effect on GDP in Nigeria. This findings does not however agreed with Chinonye (2022), Omolua and Tamunowariye (2021) as well as Ebrima, Momodou and Tsenkwo (2019) who discovered in their respective studies that, poverty sincreases GDP in Nigeria. However, this finding is in agreement with studies by Victoria and Macdonald (2021), Ade-omonijo (2021) as well as Ibekwe and Ibekwe (2022) which found inverse and significant relationship between poverty and GDP in Nigeria.

VI. CONCLUSION AND RECOMMENDATIONS

In line with findings, income disparity and economic growth in Nigeria have a long-term link. In addition, positive and negative responses in disparity to income have not indicated depleting impact to GDP for the Nigerian economy. However, sustained disparity in income could deplete economic growth through poverty shrinking channel. It is further concluded that, Population growth is potential determinant of economic growth, however, ineffective and inefficient human capital development measures posed danger for long-run sustainable economic growth for the Nigerian economy. Based on these empirical findings, the following recommendations are made;

- Government and private sector should increase income redistribution measures by actively investing in opportunities for the poor to increase their capacity to generate income. Access to micro-credit facilities will aid economic growth because the majority of people use such facilities to produce products and services. This might be accomplished by expanding successful microfinance institutions in rural regions.
- Governments at all levels, as well as the private sector, should prioritize investment in functional education and training, as well as healthcare facilities, and make them available to the public in order to enhance human capital capacity for long-term economic growth. This is vital for a rising economy like Nigeria to capitalize on its rapidly growing population.
- In the short run, social safety net support is crucial to keeping individuals out of poverty when adverse shocks strike. Proper monitoring of social assistance programs should be prioritized to guarantee that the target group benefits to the greatest extent possible.

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