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POVERTY-GROWTH-INEQUALITY TRIANGLE: EMPIRICAL EVIDENCE FROM NIGERIA

ABSTRACT

Purpose: Eradicating poverty is critical to achieving sustainable development. This study appraised the relationship between poverty, economic growth and income inequality in Nigeria and the interaction effect of growth and income inequality on Nigeria's poverty level.

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Methodology/approach: The study applied Auto-Regressive Distributed Lag (ARDL) model on annual data between 1980 and 2018

Findings: The study established that per-capita economic growth has a positive but insignificant relationship with poverty in the long run. The result also showed that inequality had a positive relationship with poverty, while the interaction of growth and inequality had a negative relationship with poverty. The Toda-Yamamoto test of causality reveals a bidirectional connection between economic growth and poverty, a unidirectional relationship from inequality to poverty, and a bidirectional relationship between growth-inequality interaction and poverty

Originality/value: The study contributes to the literature by examining the PGIT hypothesis, specifically in Nigeria. In contrast to earlier inquiries, this study investigates the interaction effect of growth and inequality on poverty. We also incorporate social development indicators into our empirical PGIT model to aid in the formulation of poverty-eradication programs in Nigeria.

Keywords: Nigeria; growth; poverty; inequality

1. INTRODUCTION

Poverty alleviation has been identified as one of the globe's most pressing issues (Hipsler, 2013). Reducing the poverty level can impact the lives of millions of people across the globe. Poverty robs people of any sense of control over their lives, violates human rights, and exposes man to life-threatening dangers (Yunus & Weber, 2007). This is corroborated by the first goal of the sustainable development goals (SDGs) which recognizes the abolition of poverty in all its dimensions and forms as a necessary condition for any nation to achieve sustainable development. A recurring question, however, is whether the primary focus of development policy should be on growth, poverty, and/or inequality. According to Bourguignon (2004), achieving the aim of rapid poverty reduction necessitates robust, country-specific combinations of growth and distribution strategies.

Food and Agriculture Organization (FAO, no date) asserts that poverty cannot be eradicated without first addressing the issue of persistent inequalities of income and economic opportunities existing among individuals, societies and within countries. This implies that poverty can be reduced by economic growth and/or improved income distribution. Although increased economic growth may result in a decrease or increase in inequality, it does not always imply a poverty reduction. The poverty-growth-inequality triangle (PGIT) is a complex link between poverty and growth that depends on the dynamics of inequality (Wan, 2008). The PGI triangle, also known as the Growth-Inequality-Poverty triangle (GIPT), describes a situation in which a country's development strategy is predicated on income inequality and income growth (Fekadu, 2009). This means that changes in poverty can be completely explained by changes in income growth and inequality.

The fight against poverty and inequality is paramount in Nigeria, with successive governments initiating several poverty reductions or alleviation programmes/projects. Some of the identifiable programmes include; The Poverty Alleviation Programme (PAP) introduced in early 2000; the National Poverty Eradication Programme (NAPEP) in early 2001; the

School-Feeding Programme (Meals for school children) in 2016; the Federal Government N-Power Programme in 2017, among others. These programmes were designed to abolish poverty that has plagued the nation since independence as well as to lessen inequality levels in the nation. Despite the various programmes and policies to eradicate poverty in Nigeria, the people are yet to feel the impact of these programmes, hence the worsening incidence of poverty (Metu & Kalu, 2019). For example, in Nigeria, more than half of the nation's population lives in extreme poverty, while a small number of elites enjoy ever-increasing riches (Proshare, 2019). Furthermore, according to World Bank (2018) report, Nigeria has surpassed India as the world's poverty capital. Despite the country's vast natural and human resources, around 152 million Nigerians live on less than \$2 per day, accounting for roughly 80% of the country's population (African Development Bank, 2018). Also, economic inequality has reached extreme levels. According to Oxfam's report, while over 112 million Nigerians were in extreme poverty in 2010, the richest Nigerian individual will need 42 years to spend all of his fortunes at a rate of one million per day. As a result, raising those living below the extreme poverty level of \$1.90 out of poverty for a year will cost around \$24 billion, which is less than the entire wealth owned by Nigeria's five richest people in 2016 (Oxfam, 2017).

Poverty in Nigeria is shocking, especially in the backdrop of a growing economy that has benefited a small group of individuals at the expense of the majority of the population. The yearly economic growth averaged more than 7% in the 2000s, even though Nigeria is one of the few African nations where the proportion of people living below the national poverty line has increased over time; it grew from 69 million in 2004 to 112 million in 2010, accounting for 69% of the population (Oxfam, 2017). During the same period, the number of millionaires increased by almost 44%, while income inequality surged from 40% in 2003 to 43% in 2009 before falling slightly to 39% in 2018 (World Bank, 2019). The growth paradox in Nigeria is that as the country becomes wealthier, only a small percentage of the population benefits, while the majority continues to experience deprivation and poverty. According to Oxfam (2017, pp 9), "[...] in Nigeria, it is clear that the top 10% of the population is capturing most of the growth while the people at the bottom are left behind. If we do not put our minds to this problem, the whole economy may be in danger."

The distribution of national income between regions and among families in Nigeria may be related to the country's poverty levels. Bourguignon (2004) shifted the focus away from the distribution of growth gains and toward the interaction of growth and distribution in the reduction of absolute poverty. This is contingent on the poverty-growth-inequality triangle (PGIT) model, which proposes a development strategy in which nations can apply a country-specific blend of growth and distribution strategies. Therefore, this study examined the Poverty-Growth-Inequality Triangle in Nigeria from 1980 to 2018. Specifically, the study appraises the long-term association between poverty, growth and inequality in Nigeria and the causal relation among these variables. The study contributes to the literature by examining the PGIT hypothesis, specifically in Nigeria. In contrast to earlier research, this study investigates the interaction effect of growth and distribution on poverty. We also supplement our empirical PGIT model with social development indicators to aid in the formulation of poverty eradication programs in Nigeria.

The paper proceeds as follows: Section 2 contains the review of literature while the next section describes the study's methodology. Section 4 and 5 document the empirical results and conclusion respectively.

2. LITERATURE REVIEW

2.1. CONCEPTUAL LITERATURE

The main thrust of this study is to investigate the link between poverty, economic growth and inequality in Nigeria; this section starts with a discussion on the key variables in the study. Poverty is a multidimensional issue and has been defined in several ways by different scholars. For instance, Ishioro et al. (2016) view poverty as deprivation, inadequate rights, economic disenfranchisement, and socio-economic constraints including exclusion. According to the Central Bank of Nigeria (1999, as cited in Metu & Kalu, 2019), a poor person cannot meet social and economic obligations; has little or no access to education, health, sanitation, and has a limited chance of welfare advancement to the limit of their capabilities. Due to differences in the operational definition of poverty, the World Bank standard of living in extreme poverty is captured as living below \$1.90 daily. People who live in extreme poverty are incapable of meeting the most basic survival necessities. In the literature, many metrics for assessing poverty have been offered, such as annual per capita income and the percentage of the population living on less than \$1 or \$2 per day. Poverty is measured in this study using the absolute poverty headcount index, which is the proportion of the population living below a specific poverty line (e.g. \$1 per day) based on household survey data.

ECONOMIC GROWTH

Economic growth is defined as the increase in the market value of an economy's commodities and services over time. It means an increase in the real gross domestic product (GDP) or national output and national income. Metu (2017) explains economic growth as the annual increase in real per capita income of a given economy over a period. This definition explains the growth of output per head. Hence, for there to be a rise in per capita income, the increase in total output must be greater than the population growth rate (Metu, 2017). This study adopts this definition of economic growth because per capita income, which is the growth of the GDP-to-population ratio (GDP per capita) is a very important aspect of economic growth.

INEQUALITY

Poverty and inequality are somehow related, but inequality involves an uneven distribution of income and opportunities among people in a society over time (Metu & Kalu, 2019). It is a global issue, and many individuals are imprisoned in poverty with few opportunities to climb the social ladder (IZA, n.d.). When considering issues such as development, living circumstances, welfare, and the influence of population-related social and economic policies, inequality cannot be overstated (Khemili & Belloumi, 2018). Economic inequality refers to great disparities in incomes, consumption and wealth. The Gini index, often known as the Gini coefficient, is a popular tool for determining how income is distributed among a population. The coefficient runs from 0 (or 0%) to 1, with 0 indicating perfect equality and 1 indicating perfect inequality. In this study, the Gini coefficient was employed to capture inequality levels.

2.2. EMPIRICAL LITERATURE REVIEW

Several studies have investigated the nexus between poverty, income inequality, and economic growth. According to Gelaw (2009), poverty is assessed by income, and there is a strong link between the two. Poverty can be lessened by boosting the income of poor workers. The literature noted that the relationship between income inequality and GDP is quite complex; it might be positive, negative, or there is no relationship at all. Barro (2000) established that the implications of income inequality on growth can be negative or positive depending on the economic development level. This study shows that income inequality in poor nations stifles economic growth, but income inequality in rich nations boosts growth.

Studies such as Alesina and Rodrik (1994) are of the view that income inequality could impede overall economic growth while studies such as Bourguignon (2004); Kakwani (1993) conclude that inequality lowers the rate at which economic expansion leads to poverty alleviation. In a study of the link between economic growth, income disparity, and poverty in China, Yao (1999) discovered that the prevalence of poverty is very sensitive to changes in per capita income and inequality. Gibson (2000) concluded that growing income inequality, rather than slow growth in average earnings, is the key driver to the rise in poverty in Papua New Guinea between 1986 and 1996. Addison and Cornia (2001) observed that rising inequality in the face of increased GDP can only translate to little or no decrease in poverty level. Wan (2008) assessed the poverty-growth-inequality nexus in China and discovered that China's income growth and distributional changes accounted for the decrease in rural poverty in the first half of the 1990s; however, in the second half of the 1990s, both rural and urban China experienced rising inequality and static income growth, resulting in a decline in poverty cutback as well as a reversal of the poverty trend.

In a study of the Pakistan economy between 1992/93 and 2007/08, Cheema and Sial (2012) discovered that inequality significantly influenced poverty. Sumarto and de Silva (2013) investigated the PGIT in Indonesia and found that growth benefits the non-poor and not the poor in Indonesia. Bader et al. (2016) study the link between economic growth and inequities in the Lao Democratic Republic and their findings imply that benefits were not dispersed fairly. Škare and Drueta (2016) concluded that growth is beneficial to poverty alleviation, but it is insufficient to achieve poverty alleviation. They argued that the extent to which growth lowers poverty is determined by the poor's absorptive capacity as well as the growth pattern and pace.

A study in Tunisia by Khemili and Belloumi (2018) discovered a long-run positive connection between income inequality and poverty, as well as a positive link between the combination of inequality and growth and poverty. In 15 Organization for Economic Co-operation and Development (OECD) nations, Royuela et al. (2018) reported a negative relationship between economic growth and inequalities. Yaskewich (2019) concludes that income inequality is not a significant impediment to economic development. Cuesta et al. (2020) employed data from five nations to find that economies can successfully grow while reducing inequality and poverty in all stages of development, even when the state is weak and fragile, and with varying historical backdrops. From 1990 to 2017, Yemeogo and Omojolaibi (2020) investigated the nexus between economic growth, trade openness, and poverty levels in Sub-Saharan African countries. Applying different estimation techniques, the authors discovered among other things, that poverty does not respond much to trade and growth shocks.

From 1984 to 2014, Lee et al. (2020) investigated the connection between income inequality, globalization, and country risk in 121 nations and found that globalization deteriorates income distribution, but that the adverse effect can be mitigated by economic and financial stability. Their finding also reveals that lower-income countries generally have higher inequality caused by globalization. Their findings also show that globalization causes more inequality in lower-income countries. From 2005 to 2018, Soava et al. (2020) investigated the connection between gross domestic product, income inequality, poverty risk, and median equivalized net income for a group of selected European Union nations. They reported that for emerging EU nations, with positive economic growth, income inequality tends to rise, but it may be mitigated by raising the danger of falling below the poverty line. However, a completely different picture was discovered for highly developed EU nations.

Scholars studying the impact of growth on poverty and inequality in Nigeria have concluded that the divide between the haves and have-nots in the country is expanding. Aigbokhan (2008) analyzed the relationship between inequality, poverty, and economic growth in Nigeria from 1986 to 1996 and discovered that there was a substantial positive relationship between growth and poverty. This suggests that the country's strong economic growth from 1986 to 1996 increased the country's poverty level. In a related study, Stephen and Simeon (2013) conclude that poverty is not reduced by economic growth. Tanimu and Saifullahi (2014) appraised the relationship between inequality, growth and poverty in Nigeria, concluding that an increase in GDP produces high levels of poverty in the country. Conversely, Kolawole et al. (2015) reported that while GDP growth increases inequality, it also lessens poverty in Nigeria. Some other studies like Deininger-Squire (1996); Dollar and Kraay (2002); Foster and Szekely (2001); Kraay (2004) have reported that at different periods reducing poverty requires a blend of growth and distribution.

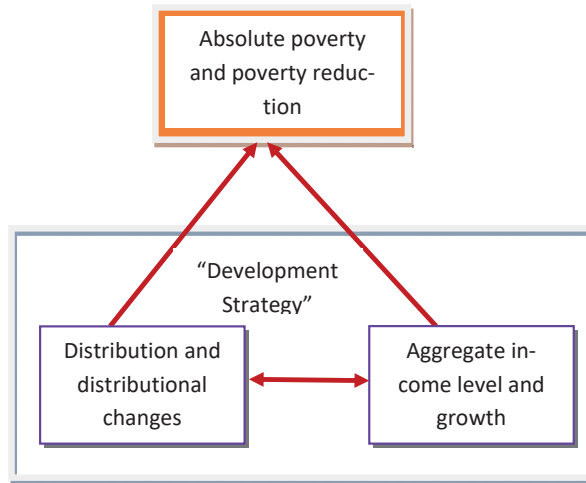
It is clear from the literature assessment that there is no agreement on the relationship between poverty, growth, and inequality. While some studies show a positive link between poverty and growth, others show a negative link. The majority of the studies looked at the link between poverty, growth, and inequality, but according to Bourguignon (2004), development policies should focus on both economic growth and distribution. Hence, this study explores the poverty-growth-inequality triangle in Nigeria from 1980 to 2018, with a focus on the interaction effect of growth and inequality (distribution) on poverty.

3. METHODOLOGY

3.1. THEORETICAL FRAMEWORK

This study's theoretical approach is based on the poverty-growth-inequality triangle (PGIT) model. Bourguignon was the first to introduce the PGIT model in 2003. According to the PGIT, addressing poverty requires a combination of national policies aimed at reducing inequality. As depicted in Figure 1, the arrows pointing out 'absolute poverty', 'growth' and 'inequality' illustrate cause and effect. In the model, inequality and growth have an impact on one another, and both have an impact on absolute poverty. As noted by Bourguignon (2003), the actual difficulty in developing a poverty-reduction strategy is in the connections between distribution and growth, rather than the relationship between poverty and growth on the one hand and poverty and inequality on the other.

Fig. 1. The poverty-growth-inequality triangle



According to the PGIT theory, reducing poverty requires both economic growth and better income distribution. The more unequal the distribution of income is at any given level of per capita income, the higher the incidence of poverty. Similarly, for any given income distribution pattern, the lower the per capita income, the higher the prevalence of poverty. Changes in poverty are explained by Bourguignon (2005) as a function of growth, distribution, and changes in distribution. This implies that:

$$\Delta \text{Poverty} = f(\text{growth, distribution, and } \Delta \text{distribution}). \tag{1}$$

Equation (1) assumes small changes in poverty. The PGIT model is therefore stated as:

$$P = F(G, D, ID) \tag{2}$$

Where P denotes poverty reduction, G denotes growth, D denotes the current distribution pattern, and ID denotes an improvement in income distribution over the preceding period.

In his model, Bourguignon (2005) utilizes the Gini index as a measure of inequality and per capita income (GDP per capita) as a metric of growth. The PGIT model varies from earlier poverty models in that it examines the relationships between growth and inequality rather than treating the two as independent entities.

3.2. METHOD OF ANALYSIS

To evaluate the cointegration relationship between poverty, growth, and income inequality in Nigeria, this study applied the autoregressive distributed lag (ARDL) model advanced by Pesaran et al. (2001). The causal relationship between the variables of interest was investigated using the Toda-Yamamoto causality test.

3.3. MODEL SPECIFICATION

The model employed in this study was adapted from Bourguignon (2004) with some modifications, by including human capital development because education and literacy have strong links with poverty. Moreover, education is highlighted as one of the most important tools for breaking the intergenerational cycle of poverty transmission (Mihai et al., 2015).

The general form of ARDL specification is depicted as:

$$Pov_t = \beta_0 + \sum \beta_1 Pov_{t-i} + \sum \delta x_{t-i} + \mu_t \quad (3)$$

Where: Pov_t is the dependent variable which is a function of its lagged values Pov_{t-i} and the lagged values of the independent variables x_{t-i} while μ_t is the error term.

The model's mathematical form is as follows:

$$Pov = f(GRW, INQ, GRWINQ, HUC) \quad (4)$$

The econometric model is specified as:

$$Pov_t = \beta_0 + \sum \beta_1 GRW_{t-1} + \sum \beta_2 INQ_{t-1} + \sum \beta_3 GRWINQ_{t-1} + \sum \beta_4 EDUC_{t-1} + \varepsilon_t \quad (5)$$

Where: Pov represents poverty incidence, GRW represent growth in per capita real gross domestic product, INQ denotes inequality captured by Gini coefficient, $GRWINQ$ represents the interaction of per capita real gross domestic product and inequality, $EDUC$ represents human capital (secondary school enrolment % of gross) t is time period; ε_t represents white noise, β_0 is the intercept, while β_1 - β_4 are the coefficients of the variables. It is expected that the values of β_1 , β_3 and β_4 will be negative and less than zero while β_2 is expected to be positive and greater than 1.

The annual time series data for 1980–2018 were obtained from the National Bureau of Statistics, Central Bank of Nigeria Statistical Bulletin and the World Bank World Development Indicators Database.

4. RESULTS AND DISCUSSIONS

4.1. TESTS FOR STATIONARITY

Table 1 shows the results of Augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests. According to the ADF test, per capita growth (GRW) and growth interaction with inequality ($GRWINQ$) are stationary at a level $I(0)$, while poverty (POV), inequality (INQ) and education ($EDUC$) are stationary at the first difference $I(1)$.

Tab. 1. Results of ADF and KPSS Stationarity Tests

Variable	ADF		I(d)	KPSS		I(d)
	Level	First diff		Level	First diff	
POV	-0.011879	-12.2875***	I(1)	0.19024*		I(0)
GRW	-2.29297**		I(0)	0.368383	0.182334*	I(1)
INQ	-0.540471	-2.472205**	I(1)	0.229757*		I(0)
GRWINQ	-2.234444**		I(0)	0.358799	0.257656*	I(1)
EDUC	0.689229	-3.102866**	I(1)	0.571659	0.096280*	I(1)
Critical Values:	1% -2.62896 5% -1.95011 10% -1.61134			1% 0.739000 5% 0.463000 10% 0.347000		

Note: ***, **, * represents Stationary at 1%, 5% & 10% respectively. Where POV = Poverty, GRW = Growth, INQ = Inequality, GRWINQ = Growth*Inequality, EDU = Education

Source: authors' computation.

On the other hand, KPSS results in Table 1 show that poverty and inequality are stationary at level, whereas the other variables (GRWINQ and EDU) were stationary at their first difference. As the results reveal that the variables are stationary at different orders of integration I(0) and I(1), we adopt the ARDL bounds test for cointegration.

4.2. ARDL BOUNDS TESTING TO COINTEGRATION

The ARDL bound test was performed to determine the variables' long-run connection. From the results in table 2, the calculated F-statistic (F-stat =4.755334) is higher than the upper bounds critical values of 4.01 at a 5% level of significance. This suggests that there exists a long-run relationship between poverty, economic growth, inequality and education in Nigeria.

Tab. 2. Cointegration Test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic K	4.755334 4	10%	Asymptotic: n=1000	3.52
		5%	2.45	4.01
		2.5%	2.86	4.49
		1%	3.25	5.06
			3.74	

Source: authors' computation.

After determining the existence of a long-run link, we investigated the long-run and short-run relationships between the variables, and the summary result is shown in Table 3.

4.3. LONG-RUN AND SHORT-RUN ANALYSIS

The findings of the long-run and short-run error correction models are shown in Table 3. The error correction model results show that the adjustment parameter [ECM(-1)] is highly significant and negative, implying long-run convergence. This coefficient demonstrates that in one year around 40% of the disparity in poverty rates in Nigeria is corrected.

Tab. 3. Results of Long-run and Short-run Analysis

Long-run regression		[Dependent Variable: POV]	
Variables	Coefficient	T-Stat	Probability
GRW	4.400322	1.461773	0.1536
INQ	0.851219	2.745743	0.0098
GRWINQ	-0.095483	-1.298265	0.2035
EDUC	-0.364759	-2.168819	0.0376
ECM Model			
C	0.243616	0.190677	0.8500
D(GRW(-1))	3.786607	1.711982	0.0969
D(INQ(-1))	0.391948	0.608916	0.5470
D(GRWINQ(-1))	-0.089371	-1.655623	0.1079
D(EDUC(-1))	-0.044397	-0.116462	0.9080
ECM(-1)	-0.402234	-5.201423	0.0000

Source: authors' computation.

From Table 3, the long-run results reveal that growth has no significant impact on poverty; there is an insignificant relationship between growth and poverty. Although this relationship is not statistically significant, it still sends a warning that economic growth in Nigeria does not trickle down to the poor masses but might lead to increased poverty. This finding supports Hanmer and Naschold's (2000) hypothesis that less-developed nations will be unable to decrease poverty only through growth. However, numerous different types of policies and programs can be used to alleviate poverty.

The findings also reveal that there is a positive and significant relationship between poverty and inequality in Nigeria. It shows that as inequality increases by 1 percent, poverty will also increase by 0.85 percent and vice versa. This result confirms the findings of Cheema and Sial (2012) and Lormobardo (2008). According to Bourguignon (2005), the main issue in developing a poverty-reduction plan is figuring out how distribution and growth interact. This necessitated the investigation of the impact of growth-inequality interaction in this study. The results of the interaction (GRWINQ) reveal no significant impact on poverty. But it is worth noting that although the relationship is not significant, it reveals a negative rela-

tionship, which implies that for poverty to be reduced, policies should be targeted at both reducing inequality and increasing economic growth.

Mihai et al. (2015) reveal a significant connection between education, literacy rates, and poverty; that, in addition to growth and inequality, efforts to reduce poverty should focus on these areas. As a follow-up on this, we included education in the model as a proxy for human capital. The findings in Table 3 indicate that human capital negatively impacts poverty during the period under review. It shows that if school enrollment improves by 1%, poverty will reduce by 0.36 points in Nigeria. The result of the short-run estimation suggests that the findings of the long-run estimation are the same for all the variables regarding the relationships. The result reveals a positive effect of economic growth on poverty at a 10% level of significance. This suggests that economic progress in Nigeria does not alleviate poverty. This outcome is consistent with the findings of Aigbokan (2000), Stephen and Simeon (2013), and Tanimu and Saifullahi (2014). This result is because of the high inequality levels in Nigeria. In the same vein, the interaction of growth and inequality reveals a negative relationship with poverty. This justifies the claim by Bourguignon (2004) that for poverty reduction to be effective, policies that must be put in place are those policies targeted at growth and inequality.

4.4. DIAGNOSTIC TESTS

The diagnostic checks were conducted using the Ramsey test, Jarque-Bera normality tests and Breusch-Godfrey serial correlation tests and the outcome is shown in Table 4.

Tab. 4. Results of the Diagnostic Tests

Test diagnostic	F-stat	Probability
Reset test (Ramsey)	5.979	0.1237
Normality test(Jarque-Bera test)	4.825	0.0896
Breusch-Godfrey Serial Correlation LM Test	0.00578	0.9399
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.47859	0.7908

Source: authors' computation.

The Ramsey test results confirm that there is no model specification problem, as shown in Table 4. Furthermore, the LM test demonstrates that serial correlation is not a concern. The Jarque-Bera and Breusch-Pagan-Godfrey tests, respectively, indicate the normality of the distribution of error terms and the absence of heteroskedasticity issues.

4.5. STABILITY TEST RESULT

Fig. 2a. CUSUM plot

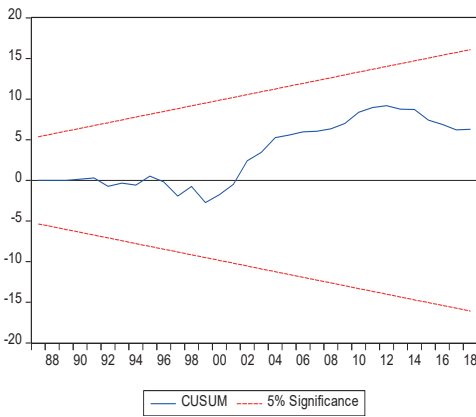
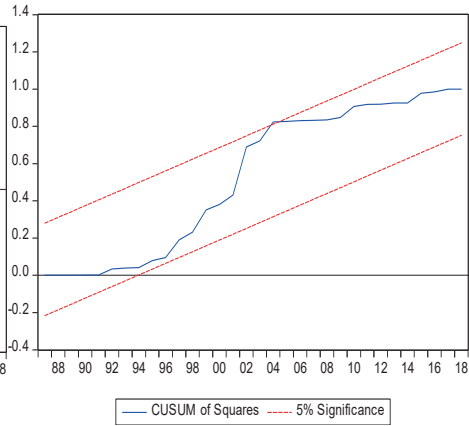


Fig. 2b. CUSUM of squares plot



Source: authors' computation.

The CUSUM and CUSUM SQ test results demonstrate the model's stability. Figures 2a and 2b indicate that the CUSUM and CUSUMSQ plots lie within the 95 percent boundaries, indicating that the parameters are stable and that the result can be used for policy analysis

4.6. TODA-YAMAMOTO CAUSALITY TEST

As shown in Table 5, the outcome of the tests reveals bidirectional causality between economic growth and poverty in Nigeria. The causality from the growth rate of GDP per capita to poverty is significant at the 10% level, while poverty granger causes growth at the 5% level.

Tab. 5. Result of Toda-Yamamoto (VAR Granger Causality/Block Exogeneity Wald) Tests

Null Hypothesis	Chi-sq	Probability	Decision
GRW does not cause POV POV does not cause GRW	8.052 11.624	0.09* 0.003**	Reject H0: Existence of causality Reject H0: Existence of causality
INQ does not cause POV POV does not cause INQ	15.768 2.740	0.003** 0.602	Reject H0: Existence of causality Accept Ho: No causality
GRWINQ does not cause POV POV does not cause GRWINQ	8.052 12.418	0.089* 0.0145**	Reject H0: Existence of causality Reject H0: Existence of causality

Table 5. Result... (cont.)

Null Hypothesis	Chi-sq	Probability	Decision
GRW does not cause INQ INQ does not cause GRW	0.617 14.061	0.9618 0.007**	Accept Ho: No causality Reject H0: Existence of causality
EDUC does not cause POV POV does not cause EDUC	5.485 0.363	0.241 0.985	Accept Ho: No causality Accept Ho: No causality

Note: *, ** shows significance at 10% and 5% level

Source: authors' computation.

The results also reveal a unidirectional connection between poverty and inequality. It shows that inequality causes poverty in Nigeria at a 5% level. The result of the interaction of growth and inequality reveals a bidirectional relation with poverty. Interaction of growth and inequality causes poverty at 10% level while poverty causes growth-inequality interaction at 5% level. The result also reveals a relationship between inequality and growth, but no causal relationship exists between education and poverty.

5. POLICY IMPLICATIONS, CONCLUSION, AND RECOMMENDATIONS

5.1. POLICY IMPLICATIONS

The short-run and long-run results indicate that per-capita economic growth has a positive association with poverty, though an insignificant relationship in the long-term. The policy implication is that economic growth in Nigeria results in increased poverty. In the same vein, inequality has a positive connection with poverty both in the short-run and long-run. The policy implication is that rising inequality results in increased poverty in Nigeria. Conversely, the interaction of growth and inequality has a negative relationship with poverty in both the short-run and long-run, and the policy implication is that to reduce poverty in Nigeria, policies that target both improvements on economic growth and reduction in inequality should be propounded. The Toda-Yamamoto test also reveals that poverty reduction strategies in Nigeria should be targeted at both growth and inequality since there is a bidirectional relationship existing between the growth-inequality interaction and poverty.

5.2. CONCLUSION

The study examined the poverty-growth-inequality triangle as well as the interaction effect of growth-inequality on poverty in Nigeria between 1980 and 2018. The PGIT model suggests that development strategies for poverty reduction require tackling the interactions between growth and inequality and not solely on growth or inequality. Using the ARDL bounds test and the Toda-Yamamoto causality test, the study supports the PGIT model and concludes that for poverty to be reduced in Nigeria, growth and inequality needs to be tackled first.

The findings of this study may be surprising considering that for a long time Nigeria has designed and implemented several policies and programmes to either reach the special needs of the poor or alleviate poverty. Poverty alleviation programmes are expected to benefit the poor by reducing their poverty level, but, the approach employed by the Nigerian government in implementing these programmes has led to their inability to address poverty.

5.3. RECOMMENDATIONS

Based on the findings, the study recommends that if the goal of development is to reduce poverty, growth strategies must be accompanied by robust distribution policies that can close the gap between the poor and the rich in the country. The inequalities in income and economic opportunities have to be addressed and one of the ways of bridging the gap is by giving tax incentives to those at the low-income level in Nigeria. Also, the adoption of the community-driven development approach in all pro-poor programmes will ensure these programmes are not hijacked by the elites in society. Investment in human capital (education) development through education will lead to a reduction in poverty levels by improving the skills and income of the poor in Nigeria. This research adds to the body of knowledge having empirically assessed the poverty-growth-inequality triangle in Nigeria and reveals that for poverty to be reduced in Nigeria, both economic growth and income distribution policies should be targeted. One of the study's primary weaknesses was the lack of data from a single source, particularly for the period studied. As a result, the various data obtained were standardized into a common form/unit.

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