ISSN:
Print - 2277 - 078X
Online - 2315 - 747X

Journal of Humanities, Social Sciences and Creative Arts

ECONOMIC GROWTH AND INCOME INEQUALITY IN SUB-SAHARAN AFRICA

*S. O. AKINBODE, T. M. BOLARINWA AND O. O. HASSAN

Department of Economics, Federal University of Agriculture, P.M.B 2240, Abeokuta, Nigeria.
*Corresponding Author: deleakinbode@yahoo.com Tel: +2348038360486

ABSTRACT

Economies of Sub-Saharan African (SSA) countries have been growing slowly in recent time. Economic growth is thought to affect inequality but not much is known about the nature of such relationship in SSA and there is no concordance among the few available. This paper examined the relationship between economic growth and inequality in the region using data from 1990 to 2017estimated with the Panel Autoregressive Distributed Lag (ARDL) Model and Granger Causality. Hausman's test suggested the superiority of the Pooled Mean Group (PMG) over the Mean Group (MG) Model. The PMG results showed that economic growth had significant and negative effect on income inequality (proxy by GINI-coefficient) in the long run suggesting a state of the later part of the Kuznet curve. This is in addition to the negative effect in the short run which is contrary to the theory. Furthermore, the result of the Granger Causality test revealed evidence of unidirectional relationship running from economic growth to income inequality in the region. Therefore, the study recommended that governments of Sub-Saharan African countries should implement policies and programmes capable of sustaining and improving inclusive growth in order to avoid high income inequality in the region.

Keywords: Inequality, Economic growth, Kuznet theory, Sub-Saharan Africa.

INTRODUCTION

The relationship between economic growth and inequality remains an important issue for national government and development organisations. The nexus between inequality and economic growth in economic literature can be traced back to the Kuznet (1955) hypothesis. The hypothesis postulates that economic growth and income inequality are related in an Inverted-U shaped curve. The hypothesis posits that when the per capita national income of a country increases, income inequality rises and after reaching its peak in the intermediate level, the income inequality falls as the economy reaches the later phase of growth/ development process. Economic growth is one of the main goals of the Sustainable Development Goals (SDGs) as reducing income inequality within and between countries is one of its important focus and thus the nexus between economic growth and inequality is an important phenomenon to development economic analyses. Over the years, economies of the world have experienced an increasing economic growth, though the magnitude of the growth differs among countries, which could be due to many reasons. Most economies of the world have experienced an increased positive growth rate over the years. Whether this increased growth rate has any link to inequality has been a major concern (Roser, 2013).

According to United Nations (2015), inequality is the state or condition of not being equal, especially in status, rights, and opportunities. Therefore, income inequality is the disproportionate distribution of income, which could be between or within an economy. The gap between the few "haves" (i.e. the rich)and the majority "have not" i.e. the poor widens with regards to access to good quality education, health services, income or wealth and nutrition. Globally, statistics show that inequality is still increasing, the rich are getting richer and poor getting poorer. The top 10 per cent of the people hold more than 75 percent of all wealth. The share of wealth held by 1 per cent of the people rose from less than 30 percent in 1989 to 38.6 percent in 2016, while the share held by the bottom 90 per cent fell to from 33.2 percent in 1989 to 22.8 percent in 2016 (Bricker *et al.,* 2017).

Income inequality has increased significantly in most of the advanced and developing countries over the years since the 1980s. For example, the richest 10 percent of the population in the OECD earn about 9.5 times the income of the poorest 10 percent, however, the ratio was at 7:1 in the 1980s (OECD,2014 and OECD, 2018). Since 1980s, increasing inequality within developing countries has increased political and social instability, which makes reduction in inequality became a new goal within the SDGs. Income inequality increased by 11 percent on average in developing countries between 1990 and 2015taking into account population size. For example, Gini coefficient of Bangladesh in 1982 was 25.88 percent and this rose up to 32.4 percent in 2016 (World Bank,2017).The NigerianGini coefficients increased from 43 percentin 1985 to 46.9 percent in 2017. Some of the developed countries of Western Europe also experience high level of inequality. Piketty (2014) opined that today's growing inequality is probably partly a result of low birth rates. Small number of children per couple leads to greater inheritances per child, which often translates into increased income inequality.

A cursory look at the African economy reveals that there is increase in economic growth, yet poverty is still highly visible, therefore, suggesting increased income inequality. According to UNDP (2017), Sub-Saharan Africa remains one of the most unequal in the world as statistics have it that 10 of its countries is recorded among the 19 most unequal countries globally. Despite the increase in GDP of several Sub-Saharan African (SSA) countries which is mostly as a result of its vast natural resources, SSA economies remains one of the poorest. The increase in GDP merely translate into '*the rich being richer while the poor get poorer'* in many of the SSA countries.

However, the relationship between inequality and economic growth has been a topic of unresolved and prolonged debate both in the developing and developed nations and among development economists. Many scholars are of the view that economic growth has actually reduced inequality in the developed countries, but one may not be able to generalize this to less developed or developing countries. Economic growth is meant to improve the standards of living of people across the globe, but most developing countries in Africa, Asia and Latin America have rather been victims than beneficiaries of the increasing economic growth as in the last two decades income inequality and poverty have increased. Thus, there is a need to evolve a study aimed at unravelling the effects of economic growth on inequality. In the light of this, this paper empirically examined the relationship between economic growth (alongside some other control variables) and inequality in Sub-Saharan Africa. Findings from the present study is expected to be useful for policy makers in achieving significant reduction in income inequality in the region while witnessing steady growth of the economies. The second section of this paper reviewed past literature and emphasized the novelty of the present study while the third section described the methodology adopted for the study. The fourth section presented and discussed the results while the last (fifth) section summarized and concluded based on the findings of the paper.

LITERATURE REVIEW

Empirical studies focusing on the relationship between growth and income inequality have provided different results overtime. Some have reported significant negative relationship while some reported positive and significant relationship. The differences might be due to different methodologies especially combinations of variables in estimated models, data and period covered by studies. Partridge (1997) investigated whether or not inequality has harmful effect on growth using data from 48 U.S states from 1960-1990. The Gini coefficient results suggested that states with more income inequality at the beginning of the period of the ten year interval data range actually experience greater subsequent economic growth.

Kirby (2000) surveyed the evidence on growing inequality in developed countries using mainly descriptive approach and reported that from the mid-1970s and throughout the 1980s in USA and Australia, and in the late 1980s in New Zealand income inequality has been on the upward trend. Panizza (2002), studied the relationship between economic growth and inequality using panel data for the period 1940 to 1980 of 48 states in the United States which were analysed with a set of structural equations and reported that there was a negative relationship between inequality and economic growth. Nel (2003) used high-quality household-expenditure-based data to estimate the effect of inequality for a sample of sub-Saharan African states using a set of cross-section data from 1986–1997. It was reported that inequality affected growth negatively over the medium term. Further analyses revealed that inequality did not affect political instability in any statistically significant manner for the countries in the sample but negatively affected risk perceptions of potential investors which has the tendency to negatively affect growth.

Odedokun and Round (2004) empirically investigated the determinants of income inequality, the effect of inequality on economic growth and the channels through which inequality affects growth. Data for 35 countries over different periods in four decades were utilized for the study. The identified determinants were the level of economic development attained, regional factors, size of government budget and the amount of budget devoted to subsidies and transfers, phase of economic cycle, share of agricultural sector in total labour force, as well as human and land resources endowment. Results also showed that inequality reduced growth. Inequality affected growth through reduction in secondary and tertiary education investment, reduction in political stability, and increase in fertility rate. Islam (2009) examined long term relationship between inequality and economic growth in Bangladesh over a 20-year period (1977-1996) using OLS estimation technique and reported that at the early stage, inequality worsened as economy improved. It then improved with time as the economy grew better and more sustainably. The study concluded that the Kuznets (1955) hypothesis was satisfied in the economy of Bangladesh.

Wahiba and Weriemmi (2014) empirically investigated the relationship between economic growth and income inequality for Tunisia, using data from 1984-2011 and analysed using GMM technique. The study reported a positive relationship between economic growth and inequality when inequality was used as the dependent variable and a negative relationship when economic growth is used as the dependent variable. The latter finding was corroborated by that of Fawaz *et al.* (2014) which used differenced GMM for a sample of 55 low-income developing countries and 56 high-income developing countries and reported a negative impact of income inequality on economic growth in low-income developing countries. Habimana (2014) investigated the relationship between inequality and the GDP growth rate based on a panel data of 29 Sub-Saharan Africa countries spanning1980-2011 analysed with a random effects model. Results showed that there was no significant relationship between inequality and economic growth in SSA. Nemati and Raisi (2015)utilized data for 28 developing countries from 1990-2010 and reported that there was a positive and negative relationship between economic growth and inequality in the short and long run respectively in line with Kuznet hypotheses. The study concluded that economic growth is a significant factor in addressing inequality in developing countries. Kolawole *et al.* (2015) examined the relationship among poverty, inequality and economic growth in Nigeria over the period of 1980 and 2012 using an OLS estimation technique and reported a positive and significant relationship between inequality and economic growth.

Massamba (2016) utilized the survey data from a sample of Sub-Saharan African countries and shows the heterogeneity in the shape and the structure of income inequality between countries and over time. Based on the new Alpha Beta Gamma method (ABG), inequality is considered as an isotropic dimension along the income scale. Furthermore, the growth-inequality relationship is defined in local domains. Different sector-led growth profiles were reported to have heterogeneous effects on inequality at the median, the top and bottom ends of the income distribution. Wang (2017) examined the effects of income inequality on real GDP of both USA and China between the period of 1980 and 2012 using co-integration model and reported a negative and significant relationship in USA in the short run, but a positive and significant relationship in the long run. It was concluded that income inequality hurt the short-run growth, but it encourages long-run growth. Yang and Greaney (2017) applied the Engle–Granger two-step ECM approach to estimate the long and short-run relationships between inequality and economic growth for four economies of China, Japan, South Korea, and the United States and concluded that in South Korea, Japan, the U.S and China the relationship between income inequality and economic growth followed the S-shape curve hypothesis in the long run, suggesting that economic growth had a significant impact on income inequality.

Akadiri and Akadiri (2018) examined the channel through which growth determinants influenced income inequality using data from

20 African countries over the period of 25 years (1991 -2015) which were estimated with a fixed effect model and reported that there was a positive and statistically significant relationship between growth and inequality. Furthermore, it was reported that the level of inequality did not determine the level of growth in the sampled African countries. The study concluded that African countries were income inequality independent economies and that income inequality will not slow down economic growth. Henry and Panotani (2019) examined the relationship between per capita national income and income inequality in Nigeria from 1981 to 2017 using a vector correction model and reported that in the short run there was a positive relationship and in the long run a negative relationship between inequality and economic growth. Odunsanya and Akinlo (2020) assessed the channels through which income inequality affect economic growth using data from 31 SSA countries from 1995–2015 which were analyzed with the two-step system generalized method of moments. Results suggested that income inequality exerted a significant positive effect on economic growth via the saving transmission channel, while it has a statistically significant negative effect on economic growth in the region through the channels of fertility, credit market imperfection and fiscal policy. From the empirical works cited so far, it is clear that the debate between economic growth and inequality in an on-going issue and findings have been very diverse. In addition, most of the reviewed papers focused on the effect of inequality on economic growth without considering the possibility of the reverse situation. The present study used the latest available data alongside appropriate analytical procedure to assess to effect economic growth on inequality in line with the Kuznet theory. In addition the paper included a combination of most relevant control variables in the empirical assessment of inequality.

METHODOLOGY

Theoretical Framework

The paper was built on the Kuznet's (1955) theory whose main argument was that in the early stages of economic growth, inequality tends to worsen but at later stages it improves. This formed the basis for the explanation of the inverted-U curve. The early stage of the curve is mostly applicable to SSA as most of the economies of the countries in the region are still in their early stages. Quite a few reasons as to why this phenomenon (inequality worsening during the early stages of economic growth) may occur has been discussed. Substantial part of the cause has to do with the structure of the economy. Early growth in accordance with the Lewis model may be concentrated in the modern industrial sector, where employment is limited but wages and productivity are high thereby causing the initial disparity in income. The Kuznets curve implies that as a nation undergoes industrialization – and especially the mechanization of agriculture – the center of the nation's economy will shift to the cities. As internal migration by farmers looking for better-paying jobs in urban hubs causes a significant rural-urban inequality gap (the owners of firms would be profiting, while laborers from those industries would see their incomes rise at a much slower rate and agricultural workers would possibly see their incomes decrease), rural populations decrease as urban populations increase. Inequality is then expected to decrease when a certain level of average income is reached and the processes of industrialization, democratization and the rise of welfare state allow for the benefits from rapid growth, and increase the per-capita income. Kuznets believed that inequality would follow an Inverted "U" shape as it rises and then falls again with the increase of income per-capita. Income inequality is measured by Gini coefficient. Evidence from literature such as Nemati and Raisi (2015) and Henry & Panotani (2019) revealed that the Kuznet Hypothesis proposed by Simon Kuznet can be used to explain the relationship between economic growth and inequality.

Model Specification

From the Kuznet theory, it can be stated that inequality depends on economic growth as:

Income inequality=f(economic growth).. (1)

However, other important determinants/ control variables for the inequality model as suggested in empirical literature were added to the model estimated in the present study. For instance, Nardi and Fella (2017) included saving in the model of inequality which was found to be an important explanatory variable. McKnight(2018)'s exposition on the link between poverty and inequality underscored the importance of poverty to income inequality. Shahabadi *et al.* (2018) modeled inequality as function of school enrolment where it was reported that primary and secondary school enrolment reduced income inequality while university education aggravated inequality. Furthermore, Wells (2006) modeled inequality as a function of education and reported that the effect of education on inequality is affected by economic freedom. Odusola *et al*. (2017) carried an extensive exposition on the relationship between population and income inequality. It was concluded from the subsequent empirical model's result that the nature of the relationship between population and income inequality was still ambiguous in Africa.

Consequent on the above the empirical model for the present study is stated as in equation 2

$$INEQ_{it} = f(EGR_{it}, SAV_{it}, POV_{it}, TSE_{it}, POP_{it}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Equation 2 can be explicitly presented in linear form as shown in Equation 3;

$$INEQ_{it} = \alpha_0 + \alpha_1 EGR_{it} + \alpha_2 SAV_{it} + \alpha_3 POV_{it} + \alpha_4 TSE_{it} + \alpha_5 POP_{it} + u_{it} \ldots . (3)$$

Where $INEQ_{it}$ represents inequality measured by Gini coefficient , EGR_{it} represents economic growth rate (measured by GDP growth rate), POV_{it} represents poverty (measured by per capita household consumption expenditure), SAV_{it} represents gross saving, TSE_{it} represents total secondary school enrolment in each country, POP_{it} represent Population growth rate and u_{it} represents error term in country "*i*" at time "*t*".

Data Sources and Measurements

In order to address the objective of the study, data for 12 SSA countries were used. This was due to unavailability of data for some countries. The countries selected were Nigeria, Ghana, Niger, Mali, Botswana, Eswatini (Swaziland), Namibia, South Africa, Kenya, Tanzania, Uganda and Burundi, over a period of twenty-eight years (1990-2017).

Table 1: Variables, sources and measurements

Variables	Measurement(s)	Sources
Inequality (INEQ)	Inequality is measured by Gini coefficient Index which measures the extent to which income distribution among households within an economy deviates from a perfectly equal distribution. Data is in percentage (WDI, 2019).	WDI
Economic Growth (EGR)	Annual percentage growth rate of GDP at market prices. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products (WDI, 2019).	WDI
National savings (SAV)	It is proxy by gross savings at constant US$ and calculated by deducting total consumption from the gross national income, plus net transfers (WDI, 2019).	WDI
Total secondary school enrolment (TSE)	It is calculated by dividing the number of students enrolled in secondary education by the population of the age group which officially corresponds to secondary education, and multiplying by 100(WDI, 2019).	WDI
Poverty (POV)	It is proxy by household final consumption expenditure which is the market value of all goods and services, including durable goods (such as computers, cars, etc.) purchased by households. It is also measured in US dollars (WDI, 2019).	WDI
Population Growth (PGR)	Annual population growth rate for year *t* is the exponential rate of growth of midyear population from year *t-1* to *t*, expressed as a percentage (WDI, 2019).	WDI

Source: Authors' compilation, 2019

Estimation Procedures

Pre–estimation: This includes the descriptive statistics which gives comprehensive information about the characteristics, distribution and behaviour of the series under consideration such as the mean, median, skewness, kurtosis, standard deviation, maximum and minimum values, etc. Correlation analysis which is used to measure the strength of association between variables were also estimated in order to take precaution against multicollinearity in the model. The Pearson correlation coefficient procedure was adopted. Furthermore, the Augmented Dickey Fuller test (ADF) and Im, Pesaran and Shin (IPS) panel unit root test were used to examine the stationarity of the variables in the model.

Estimation: The panel Auto-Regressive Distributed Lag technique (ARDL) developed by Pesaran, Shin and Smith was used to analyse the model for this study. The choice of the method depended on the result of the unit root test where the series were integrated of different orders. Subsequently, the Pool Mean Group (PMG) estimator of the Panel ARDL was used in line with the result of the Hausman test which suggested the superiority of the PMG estimator over the

Mean Group (MG) estimator in the present study. The PMG Estimator allows for the short run coefficients, including the intercepts, the speed of adjustment to the long run equilibrium value and the error variance to be heterogeneous country by country while the long run coefficients are assumed to be homogenous across all countries. It should be noted letter *L* was added to logged variables prior to estimation.

$$INEQ_{it} = \propto_0 + \propto_1 EGR_{it-1} + \propto_2 LSAV_{it-1} + \alpha_3 LPOV_{it-1} + \propto_4 TSE_{it-1} + \propto_5 POP_{it-1} + \sum_{j=1}^{p} \beta_1 \Delta INEQ_{it-j} + \sum_{j=1}^{q} \beta_2 \Delta EGR_{it-j} + \sum_{j=1}^{q} \beta_3 \Delta LSAV_{it-j} + \sum_{j=1}^{q} \beta_4 \Delta LPOV_{it-j} + \sum_{j=1}^{q} \beta_5 \Delta TSE_{it-j} + \sum_{j=1}^{q} \beta_6 \Delta POP_{it-j} + \varphi_i + u_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4)$$

Causality Test: This test was carried out purposely to determine the direction of causality between two variables. Granger causality test is a statistical hypothesis for determining whether one-time series is good in forecasting another. The pairwise granger causality model which was originally proposed by Engle and Granger (1987) and Granger (1988) was used to examine the causal relationship between economic growth and inequality using the Vector Autoregression (VAR) mechanism following Abakumova and Primierova (2018)isstated as;

$$INEQ_{it} = \sum_{m=1}^{p} \alpha_{1m} INEQ_{it-m} + \sum_{j=1}^{p} \gamma_{1j} EGR_{it-j} + u_{it1} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . (5$$

$$EGR_{it} = \sum_{m=1}^{p} \beta_{1m} INEQ_{it-m} + \sum_{j=1}^{q} \pi_{1j} EGR_{it-j} + u_{it2} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . (6)$$

RESULTS AND DISCUSSION

Descriptive Statistics

Summary of the descriptive statistics of the study variables is presented in Table 2. Recall that INEQ represents the inequality (which was measured with Gini coefficient), EGR represents the GDP growth rate, POV represents poverty (proxy by household final consumption expenditure), SAV represents saving, POP represents population growth rate and TSE represents the total secondary school enrolment rate. The average values of the variables were47.1825, 4.16 percent, $1459.6, $13.8 billion, 43.32 percent and 2.49 percent for INEQ, EGR, POV, SAV, TSE and POP respectively. The maximum and the minimum values are also presented in Table2.All the series skewed to the right except population growth implying that majority of the values lied to the left (lower values) of the distribution while few lied to right (are of relatively higher values). On the other hand, the kurtosis statistics indicated that INEQ and TSE were platykurtic since their kurtosis values were less than 3.00. This implied that their distributions have relatively flat peaks. EGR, SAV and POV were leptokurtic (highly peaked) since their kurtosis values were greater than 3.00 while POP was relatively mesokurtic implying moderate peak or near normal distribution as the value was close to 3. Since neither kurtosis nor skewness can independently confirm normality of a series, the Jarque-Bera statistics which combines the properties of kurtosis and skewness was estimated to give comprehensive information about series' normality. The probability values for the Jaque-Berra tests were less than 5 percent and this suggested that the hypothesis of normal distribution is rejected and therefore study series could not be regarded as being normally distributed.

Table 2: Descriptive statistics of study variables

	INEQ	EGR	POV	SAV	TSE	POP
Mean	47.1824	4.1694	1,459.60	13800000000	43.3246	2.4941
Median	43.6583	4.3419	1,065.00	2040000000	41.1245	2.6053
Maximum	68.2833	21.0180	4,579.95	147000000000	102.7539	3.9072
Minimum	25.8836	-8.0000	184.50	-24249473	5.2171	0.3401
Std. Dev.	10.2967	3.4618	522.24	25100000000	25.8441	0.7809
Skewness	0.4068	0.0512	3.91	2.504082	0.2529	-0.5982
Kurtosis	1.9709	5.8893	1.76	9.110441	1.9943	2.8896
Jarque-Bera	24.0927	117.0197	3848.40	873.8687	17.7453	20.2120
Probability	0.0000	0.0004	0.0009	0.0002	0.0001	0.0000
Observations	336	336	336	336	336	336

Source: Authors' computation (2019)

Correlation Analysis

Correlation analyses were carried out to avoid multicollinearity in the model to be estimated. High correlation between two independent variables portends this serious econometric problem which may render outcome of the estimation useless due to some obvious consequences which accompany multicollinearity. It may lead to indeterminacy of the determinant of the data matrix which makes estimation of the coefficients sometimes difficult. The parameter estimates can gyrate wildly (i.e. take on a wide range of values) depending on which other regressors are present in the model. Furthermore, multicollinearity may reduce the precision of the estimate coefficient which weakens the statistical power of the regression model. Therefore, avoiding it in a model is basic to the success of any applied research. From the coefficients of the different pairs of variables as presented in Table 3, it is obvious that none of the coefficients was high enough to cause multicollinearity in the model. Most authors get worried with correlation coefficients higher than 0.75 but there is no generally acceptable cut-off for this. However, Iyoha (2004) posited that a correlation coefficient of about 0.95 and above portends the danger of multicollinearity in estimated model.

Table 3: Correlation Analysis of the study variables

	INEQ	EGR	POV	SAV	TSE	POPGR
INEQ	1					
EGR	-0.0797	1				
POV	-0.0724	0.0722	1			
SAV	-0.0950	0.1071	0.6031	1		
TSE	0.6045	0.0055	-0.0657	0.1097	1	
POPGR	-0.5778	0.1692	0.0385	0.0293	-0.5695	1

Source: Authors' computation (2019)

Test of Stationarity

The Augmented Dickey-Fuller (ADF) and Im, Pesaran & Shin (IPS) panel Unit root tests were employed in the study and their results are presented in the Tables 4 and 5. Note that the logarithm values of SAV and POV were used for the unit root test. The ADF test results revealed that all variables were stationary at level i.e. I(0) except GINI and LPOV which were stationary at first difference i.e. I(1). In addition, IPS unit root test results showed that all the series were stationary at level except TSE which became stationary at first difference.

Table 4: Augmented Dickey Fuller (ADF) Unit root Test

Variables	Level			First Difference			I(d)
	None	Indiv. Intercept	Trend & Intercept	None	Individual Intercept	Trend & Intercept	
GINI	29.29	36.28	28.46	67.47***	35.38*	25.50	I(1)
EGR	57.63***	147.67***	27.85**	-------	--------	-------	I(0)
LSAV	2.41	31.79**	64.24***	-------	-------	--------	I(0)
LPOV	5.62	16.07	14.94	157.11***	152.21***	33.994*	I(1)
TSE	5.36	43.57***	24.09***	------	-------	--------	I(0)
POP	32.86	53.57***	12.74**	------	-------	--------	I(0)

Source: Authors' computation (2019)

Table 5: Im, Pesaran and Shin (IPS) Unit root Test

Variables	Level		First Difference		I(d)
	Individual Intercept	Trend & Intercept	Individual Intercept	Trend & Intercept	
INEQ	-1.9683**	-0.4694	-------	--------	I(0)
EGR	-10.7485***	-10.9443***	-------	--------	I(0)
LSAV	-0.3353	-3.9943***	-------	--------	I(0)
LPOV	1.0824	-1.6687**	------	--------	I(0)
TSE	4.2258	2.2049	-5.2365***	-8.2796***	I(1)
POP	-3.2043***	-4.1426***	-------	--------	I(0)

Source: Authors' computation (2019)

*Significant at 10%, **Significant at 5% and ***significant at 1 %

Estimation

Recall that the variables series were integrated of different orders i.e. some at I(0) while others were I(1).The study therefore adopted the appropriate estimation technique capable of handling such combination which is the panel Autoregressive Distributed Lag (ARDL) model. The Pool Mean Group Estimation (PMG) of the panel ARDL was preferred over Mean Group Estimation (MG) in the present study following the result of the Hausman test. The PMG estimator has both long run and short run coefficients for variables in the model. The MG results and the Hausman test are reported in the Appendix.

Short run Analyses and Discussion

Table 6 presents the short run results of the panel ARDL model. It is clear that only EGR *(P<0.01)*significantly affected inequality in the short run. A percent increase in economic growth resulted in -0.015 percent reduction in inequality in the short run. The negative effect of economic growth on inequality in the short run is contrary to the Kuznet hypothesis which proposed a positive relationship in the short run. The result also contradicts that of Nemati and Raisi (2015) which reported a positive relationship between economic growth and inequality in the short run for a group of 28 developing countries. In the same vein, Wahiba and Weriemmi (2014) reported positive relationship in Tunisia. The different sign of the growth coefficient in the present study may be due to the difference in the background structures of the economies of SSA countries. Gross saving, poverty, population growth and total secondary school enrolment rate did not have any significant effect on inequality in the short run. The short run error correction term (ECT) was negative, less than one and significant at acceptable risk level and thereby confirmed its validity. The ECT result shows the speed of adjustment of inequality to its long run equilibrium. The coefficient for adjustment for income inequality which was-0.094 implied that only 9.4 per cent of the total disequilibrium in the previous year is corrected in the present year. Therefore, it will take about 11 years for inequality in SSA countries to adjust back to its long run equilibrium path in the case of any shock into the system.

Table 6: Short run model

Variables	Coefficient	Z-Statistic	Probability
ECT	-0.094**	2.51	0.013
D(GDPGR)	-0.0151*	-1.88	0.079
D(LSAV)	0.0839	0.24	0.813
D(LPOV)	1.5635	0.62	0.536
D(TSE)	-0.0273	-0.37	0.712
D(POP)	-4.1671	-1.48	0.140
CONS	3.1630	-0.66	0.509

Source: Authors' computation (2019)

*Significant at 10%, **Significant at 5% and ***significant at 1 %

Long run Discussion

Table 7 presents the long run results of the Pooled Mean Group (PMG). The results show that all the regressors except POP significantly affected inequality in the long run in SSA. EGR coefficient value of -0.5977 implied that an increase in economic growth by 1 percent decreased inequality by about 0.6 percent. This implies that the growth in Sub-Saharan Africa has been inclusive, such that the poor are moving above the poverty line as economies in the region improve. The long run inequality decreasing effect of economic growth is in line with the Kuznet's U-shape theory. This also corroborates the findings of Nemati and Raisi (2015) in a study of 28 developing countries, but, contradicted that of Wahiba and Weriemmi (2014) which reported positive relationship between economic growth and inequality in Tunisia.

Furthermore, a percent increase in saving caused about 3.9 percent increase in inequality in SSA. The result of the gross saving conforms with the *a priori* expectation as well as with the view of Kuznet that one factor that increases income inequality is the concentration of savings among the rich. This implies that inequality will keep increasing as the gross saving increases unless the poor are able to benefit from the investment (savings) of the rich. Increased saving may reduce aggregate consumption and demand which may increase inequality. In the same vein, poverty also increased inequality in line with expectation. A percent increase in poverty increased inequality by 2.73 percent. Expectedly, increase in school enrolment decreased inequality in the region. It is expected that as more people get educated and are better empowered in capability and knowledge there is going to be some reduction in the level of inequality in the society. An increase in school enrolment by 1 percent decreased inequality by 0.2 percent in SSA. A better educated individual is seen as a skilled labour who *ceteris paribus* are likely to get a relatively higher paying job or have the tendency to become a successful entrepreneur which will reduce inequality. This corroborates the finding of Shahabadi *et al*. (2018) which reported that enrolment in primary and secondary schools in selected Islamic countries significantly reduced inequality. However, the study reported inequality increasing effect of university enrolment which was ascribed to the higher income earned by university graduates which was said to be promoting inequality. Wells (2006) also reported that school enrolment reduced inequality but the effects of education on income inequality were affected by the level of economic freedom in a country, and specifically that more economic liberalization may limit the equalizing effects of secondary enrolments.

Table 7: Long run model

Variables	Coefficient	Z-Statistic	Probability
GDPGR	-0.5977**	-2.34	0.019
LSAV	3.9780***	2.86	0.004
LPOV	2.7324***	3.52	0.000
TSE	-0.2048*	-1.76	0.079
POP	-0.5609	-0.36	0.717

Source: Authors' computation (2019)

*Significant at 10%, **Significant at 5% and ***significant at 1 %

Causality Test

The Granger causality test was used to determine the direction of causality between the two main variables in the study and the results are presented in Table 8.The results revealed that the null hypothesis that EGR does not Granger cause INEQ was rejected because its probability value was less than 5 percent. It was concluded that economic growth caused inequality. This corroborates the panel ARDL result. On the other hand, the null hypothesis that INEQ does not Granger cause EGR was accepted because the probability value was greater than 5 percent. In summary, the study found a unidirectional causality between economic growth and inequality. In addition, the fear of possible endogeneity in the estimated panel ARDL model is allayed. Thus, in sub-Saharan Africa countries, economic growth affect income inequality. This result conformed with Adeleke and Sule(2020) which also reported a unidirectional causality running from economic growth to income inequality in upper middle income countries in SSA. It also conformed with the result of Assane and Grammy (2003) who reported a unidirectional causality running from economic growth rate to inequality in the United States. It is however contrary to the finding of Amri and Nazamuddin (2018) from the study of 26 provinces covering 2005-2015 in Indonesia who reported a unidirectional causality running from inequality to economic growth.

Table 8: Granger Causality test result

Null Hypothesis:	F-Statistic	Probability
EGR does not Granger Cause INEQ	4.2979**	0.0437
INEQ does not Granger Cause EGR	0.5250	0.4692

Source: Authors' computation (2019)

*Significant at 10%, **Significant at 5% and ***significant at 1 %

CONCLUSION AND RECOMMENDATIONS

The study examined the relationship between inequality and economic growth in Sub-Saharan Africa from 1990 to 2017 using PMG estimator of the panel ARDL Model. The analyses showed that economic growth significantly and negatively affected inequality both in the short and the long run, thereby partially agreeing with the kuznet's U-shape theory. Likewise, the Granger causality test revealed that GDP growth rate unidirectionally granger causedincome inequality in the region. This is consistent with the findings of Nemati and Raisi (2015)and also agreed with the Kuznet hypothesis. It was concluded that the Kuznet hypothesis holds in sub-Saharan Africa, especially, in the long run. From the analyses, it was concluded that economic growth in Sub-Saharan Africa has been inclusive, since the increasing economic growth reduced inequality. Gross savings and poverty have positive and significant effect on inequality. In addition, total secondary school enrolment negatively and significantly affected income inequality. Hence, governments in sub-Saharan African should seek ways to reduce inequality by implementing policies and strategies which will improve and sustain inclusive economic growth. Aggregate saving should be channelled towards beneficial investments while governments invest in education and encourage school enrolment in order to reduce inequality.

REFERENCES

Abakumova, J., Primierova, O. 2018. Globalization, growth and inequality: testing Causality and asymmetries. *Ekonomicko-manazerske spektrum* 12(2): 83-95.

Adeleke, G.A., Sule, T.A. 2020. Causal Nexus among Fiscal Policy, Economic growth and Income Inequality in Sub-Saharan African Countries (1995-2016). *African Journal of Economic Review* 8(1): 1-25.

Akadiri, S., Akadiri, C. 2018. Growth and Inequality in Africa: Reconsideration. *Academic Journal of Economic Studies* 4(3): 76–86.

Amri, K., Nazamuddin, N. 2018. Is There Causality Relationship Between Economic Growth And Income Inequality?: Panel Data Evidence From Indonesia," *Eurasian Journal of Economics and Finance* 6(2): 8-20.

Assane, D., Grammy, A. 2003. An assessment of the growth and inequality causality relationship. *Applied Economics Letters* 10(14): 871–873.

Bricker, J., Dettling, L.J., Henriques, A., Hsu, J.H., Jacobs, L., Moore, K.B., Pack, S., Sabelhaus, J., Thompson, J. , Windle, R.A. 2017. Changes in U.S. Family Finances from 2013 to 2016: Evidence from the Survey of Consumer Finances. *Federal Reserve Bulletin* 103(3): 1-42.

Engle, R.F., Granger, C.W.J. 1987. Co-integration and error correction: representation, estimation, and testing. *Econometrica* 55: 251–276.

Fawaz, F., Rahnama, M., Valcarcel, V.J. 2014. A refinement of the relationship between economic growth and income inequality. *Applied Economics* 46: 3351–61.

Granger, C.W.J. 1988. Some recent developments in the concept of causality. *Journal of Econometrics* 39:199–211.

Henry, J., Panotani, P. 2019. Relationship between per Capita National Income and Income Inequality: Is the Kuznets Hypothesis True for Nigeria?. *International Journal of Innovative Science and Research Technology* 4 (4): 198-206.

Islam, S. 2009. Inequality and economic growth in Bangladesh–a diversified evidence on Kuznets pattern `U` hypothesis. J. *Bangladesh Agric. Univ.* 7(1): 117–123.

Iyoha, M.A. 2004. Applied econometrics (Second Edition). BeninCity, Nigeria: Mindex Publishing.

Kirby, P. 2000. The Social Impact of Economic Liberalisation: Evidence from Latin America. *In Trócaire Development Review 2000*. Pp. 49-80.

Kolawole, B., Omobitan, O., Yakub, J. 2015. Poverty, Inequality and Rising Growth in Nigeria: Further Empirical Evidence. *International Journal of Economics and finance* 7(2): 51-62.

Kuznets, S. 1955. Economic growth and income inequality. *The American economic review* 45(1): 1-28.

Massamba, S.L. 2016. Growth and inequality in Sub-Saharan Africa: insight from a linked abg method and cge modeling. Available online at https://www.istat.it/storage/icas2016/a03-liganemassamba.pdf

McKnight, A. 2018. How are Inequality and Poverty Linked? Presentation at the UN expert meeting: *New Research on Inequality and Its Impacts.* Centre for Analysis of Social Exclusion, London School of Economics, 12th and 13th September 2018.

Nardi, M.D., Fella, G. 2017. Saving and wealth inequality. *Review of Economic Dynamics* 26: 280–300.

Nel, P. 2003. Income inequality, economic growth, and political instability in sub-Saharan Africa. *The Journal of Modern African Studies* 41(4):611-639. doi:10.1017/S0022278X03004403.

Nemati, M., Raisi, G. 2015. Economic growth and income inequality in Developing countries. *International Journal of Life Sciences 9*(6): 79-82.

Odedokun, M., Round, J. 2004. Determinants of income inequality and its effects on economic growth: evidence from African countries. *African Development Review*, *16* (2): 269–84.

Odusanya I.B., Akinlo, A.B. 2020. Growth effect of income inequality insub-Saharan Africa: exploring thetransmission channels. *International Journal of Management and Economics* 56(2): 176–190.

Odusola, A., Mugisha, F., Workie, Y., Reeves, W. 2017. Income Inequality and Population Growth in Africa. In: Income Inequality Trends in Sub-Saharan Africa: Divergence, Determinants and Consequences. Available at SSRN: https://ssrn.com/abstract=3101800.

OECD 2014. Focus on Inequality and Growth. Directorate for Employment, *Labour andSocial Affairs*. Pp. 1-4.

OECD 2018. Inequalities in household wealth across OECD countries: Evidence from OECD wealth Distribution Database. *Statistics and Data Directorate* 1: 1-69.

Habimana, O. 2014. Inequality and Economic Growth in Sub-Saharan Africa. *International Journal of Business Management and Economic Research* 5(6): 100-103.

Panizza, U. 2002. Income Inequality and Economic Growth: Evidence from American Data. *Journal of Economic Growth* 7: 25-41.

Partridge, M. 1997. Is Inequality Harmful For Growth? Comment. *American Economic Review* 87(5): 1019-1032.

Piketty, T. 2014. *Capital in the Twenty-First Century*, Harvard University Press, ISBN 978-0674430006.

Roser, M. 2013. Economic Growth. *Published online at OurWorldInData.org.* Retrieved from: 'https://ourworldindata.org/economic-growth' August 30, 2020.

Shahabadi, A., Nemati, M., Hosseinidoust, S.E. 2018. The effect of education on income inequality in selected Islamic countries. *International Journal of Asia Pacific Studies* 14(2): 61–78. https://doi.org/10.21315/ijaps2018.14.2.3.

United Nations 2015. Concepts of Inequality. *Department of Economics and Social Affairs* 1:1-2.

United Nations Development Program-UNDP 2017. Income Inequality Trends in sub-Saharan Africa: Divergence, Determinants and Consequences. UNDP Regional Bureau for Africa UN Plaza, New York. Retrieved from https://www.undp.org/ on May

13, 2020.

Wahiba, N. and Weriemmi, M. 2014. The Relationship between Economic Growth and Income Inequality. *International Journal of Economics and Financial Issues* 4(1): 135-143.

Wang, Y. 2017. Will Inequality Affect Growth? Evidence from USA and China since 1980. *Research in World Economy* 8(2): 1-11.

Wells, R. 2006. Education's effect on income inequality: an economic globalization perspective. *Globalisation, Societies and Education* 4(3): *371–391*. DOI: 10.1080/14767720600955428.

World Bank 2017. GINI index (World Bank estimate) – Bangladesh. Retrieved from https://data.worldbank.org/indicator/SI.POV.GINI?locations=BD on May 15, 2020.

World Development Indicator - WDI (2019). Development database. Retrieved on April 29, 2019 from https://data.worldbank.org/indicator.

Yang, Y., Greaney, T.M. 2017. Economic growth and income inequality in the AsiaPacific region: A comparative study of China, Japan, South Korea, and the United States. *Journal of Asian Economies* 48(2): 6-22.

APPENDIX

Mean Group results

	D.Gini	Coef.	Std. Err.	Z	P>z
LR	Gr	.3146906	.3615786	0.87	0.384
	Lsav	-6.98597	6.635636	-1.05	0.292
	Lpov	-41.8033	55.39684	-0.75	0.450
	TSE	.6319959	.4329675	1.46	0.144
SR	ECT	-.096508	.0694965	-1.39	0.165
	GINI(D2).	.5249864	.0987795	5.31	0.000
	GDPGR(D1)	-.020961	.0587477	-0.36	0.721
	GDPGR(D2)	.0151332	.0219459	0.69	0.490
	LSAV(D1).	.0001893	.3310725	0.00	1.000
	LPOV(D1).	4.628469	3.954295	1.17	0.242
	LPOV(D2).	-3.29397	2.890345	-1.14	0.254
	TSE(D1).	.0684414	.0672636	1.02	0.309
	TSE(D2).	-.023901	.0321941	-0.74	0.458
	_cons	20.15715	11.12435	1.81	0.070

Hausman test result

Command: hausman mg pmg, sigmamore

	Coefficients			
	(b) Mg	(B) pmg	(b-B)Difference	sqrt(diag(V_b-V_B))S.E.
Gr	.3146906	-.9495791	1.26427	.5212544
Lsav	-6.98597	8.877863	-15.86383	11.52206
Lpov	-41.80331	34.98453	-76.78785	98.77215
TSE	.6319959	-.4862643	1.11826	.7578908

b = consistent under Ho and Ha; obtained from xtpmg
B = inconsistent under Ha, efficient under Ho; obtained from xtpmg
Test: Ho: difference in coefficients not systematic
$chi^2(4) = (b-B)'[(V\_b-V\_B)^{(-1)}](b-B)$
= 6.82
$Prob>chi^2$ = 0.1459

(*Manuscript received: ; accepted:)*