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RESEARCH PAPER

Income Distribution and Growth Process in Sub-Saharan Africa

Ibrahim Abidemi Odusanya[a,*] , Anthony Enisan Akinlo[b], Abayomi Toyin Onanuga[c]

a, c. Department of Economics, Olabisi Onabanjo University, Ago-Iwoye, Nigeria
b. Department of Economics, Obafemi Awolowo University, Ile-Ife, Nigeria

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Abstract
Sub-Saharan Africa (SSA) is one of the regions of the world that exhibits high disparities in income distribution. Income inequality has remained ubiquitous and pronounced across countries in the region, with Sub-Saharan Africa ranking closely behind Latin America as the second most unequal region globally. This paper specifically investigates the effect of disparities in income dispersion on economic growth in SSA countries from 1995-2015 using the Blundell-Bond panel estimation procedure. Results from our analysis generally indicate that income inequality has a consistent, direct, and significant noxious effect on growth, implying that income inequality stifles growth in the region.
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Introduction

Income inequality is one of the existing challenges of the world in the 21st century. The widening gap between the rich and the poor has constituted a defining contemporary challenge, making the extent of inequality, its drive, and stemming the trend, the most hotly debated issues among economists. Given its ubiquity, Sub-Saharan Africa like other regions of the world is not eluded from its consequences. Sub-Saharan Africa (SSA) is the second most unequal region (in terms of the income distribution) after Latin America. Despite the decline in average Gini for the SSA region between 1991 and 2011 by a 3.4 percentage point, the region remains unequal. Ironically, six out of the fastest-growing economies in the world (Rwanda, Nigeria, Ethiopia, Mozambique, Chad and Equatorial Guinea) between 2001 and 2010 are in Sub-Saharan Africa. During this period, 12 countries drawn from Central and Southern Africa experienced increased income inequality (Odusola et al., 2017). Based on data on 29 countries in Sub-Saharan Africa, between 1971 and 2011, South Africa and Botswana had the highest Gini index (Hakura et al., 2016; Adesina, 2016). There has been a rising trend of income inequality despite the exceptional growth in the economies of the region. Some of the countries in the region witnessed a decline in income inequality due to their impressive economic performance and positive external conditions. However, countries like Ghana and Botswana among others did not record a decline in income inequality despite the surge in their economic growth (Adesina, 2016). Income inequality inhibits economic growth in the region through capital market imperfection, fertility differential, human capital, and fiscal policy channels (Odusanya and Akinlo, forthcoming).

The relationship between income inequality and growth is indeed a complicated theoretical and empirical issue. There has been no consensus on the direction of the effect. Four distinct

*. Corresponding author email: Ibrahim.odusanya@oouagoiwoye.edu.ng

outcomes or positions exist in the empirical studies investigating the effects of income inequality on economic growth. These studies have affirmed a positive, negative, non-linear, and ambiguous (or inconclusive) relationship (Charles-Coll, 2013; 2014). It is important to reiterate that lack of consensus in the findings could be attributed to several problems associated with lack of quality/highly comparable data with large coverage, and endogeneity. They also include specification of the model, issue of omitted variables in the regression specification, and sensibility to the inclusion of regional dummies which may indeed alter the sign of the relationship between income inequality and economic growth (Garcia-Penalosa and Turnovsky, 2006; Ehrhart, 2009; Yang and Greaney, 2017). The pooling together of developed and less developed countries is a very crucial problem. This is because it becomes unclear whether the results depict an average effect that does not hold equally for the developed and less developed economies (Partridge, 1997; Boushey and Price, 2014; Cingano, 2014; Babu et al., 2016). The existing empirical literature has also failed to capture the effect of income inequality in Sub-Saharan Africa despite its rifeness and peculiarity in the region. In addressing the aforementioned issues, we applied the system Generalized Method of Moments (GMM) to income inequality data on 31 Sub-Saharan African countries. The system GMM is more appropriate than other instrumental variables methods in handling the endogeneity and similar estimation problems peculiar to the income inequality-growth relationship. Additionally, we used income inequality data from the Standardized World Income Inequality Database (SWIID) that is of better comparability and larger coverage, compared to data from World Income Inequality Database (WIID) and Luxemburg Income Study (LIS). Based on these procedures, we ascertained the deleterious impact of the rising income inequality on economic growth in the SSA region. This study contributes substantially to knowledge as it provides insight into how income inequality explicitly affects growth in the economies of Sub-Saharan African countries.

Literature Review

A litany of studies has examined the effect of income inequality on economic growth. This is in line with the approach of Kaldor (1956) to the inequality-growth nexus. Findings from these studies have been so far not consensual. The results have been a positive, negative, ambiguous, or non-linear association between income inequality and economic growth. Partridge (1997) finds that income inequality exerts a positive on economic growth in US, implying that more income inequality results in greater subsequent economic growth. This finding conforms to those of Li and Zou (1998), Forbes (2000), Lundberg and Squire (2003), Chan, Zhou and Pan (2014), Muinelo-Gallo and Roca-Sagales (2013) and Li et al. (2016). However, studies like Perrson and Tabellini (1994), Alesina and Rodrik (1994), Clarke (1995), Birdsall and Londono (1997), Panizza (2002), and Krongkaew and Kakwani (2003) established a negative effect of income inequality on economic growth. Findings from these studies are consistent with Knowles (2005), Barro (2008), Yue (2011), Herzer and Vollmer (2012), Charles-Coll (2014), Ostry et al. (2014), Cingano (2014), Matti (2015), Dabla-Norris et al. (2015) as income inequality was found to directly impair growth process. Similarly, Tongur and Elveran (2016), Hakura et al. (2016), Babu et al. (2016), Kennedy et al. (2017), and Madsen et al. (2018) find direct noxious effect of income inequality on economic growth.

Some other studies on income inequality-growth nexus reported mixed findings. Studies like Perotti (1992), Deininger and Squire (1998), Castello and Domenech (2002), Chen (2003), Pagano (2004), Voitchovsky (2005), Bengoa and Sanchez-Robles (2005), Castello-Climent (2010), Charles-Coll (2010), Binatil (2012), Davtyan (2014) among others, reported mixed results on the effects of income inequality on growth. For instance, Deininger and Squire (1998) find initial income inequality not to be a robust determinant of subsequent growth while initial

inequality in an asset is a significant determinant of subsequent growth while Chen (2003) reports an inverted-U relationship between the initial distribution of income and long-term economic growth. Perotti (1992) finds income inequality to have a positive effect on the economic growth of poor countries while it has a negative effect on the economies of rich countries. However, Bengoa and Sanchez-Robles (2005) find a humped-shaped association from the investigation of the effect of inequality in low-income countries. Castello-Climent (2010) examines the effect of both income inequality and human inequality on economic growth for 102 countries across the world. Controlling for country-specific effects and taking cognizance of the persistence of indicators of income inequality, both income and human inequality influence growth negatively in low and middle-income countries. Meanwhile, the effects of income inequality and human inequality were positive for the high-income countries. Cingano (2014) also observes that income inequality has a significant negative effect on subsequent growth for a sample of 31 OECD countries. Findings from the results of system GMM suggest a sizeable and significant effect of income inequality on economic growth with a reduction in income inequality translating to a quite substantial improvement in growth in economies of 31 OECD-member countries. Yang and Greaney (2017) examine the effect of income inequality on economic growth both in the short and long-run periods using the Engle-Granger two-step ECM technique. Findings from the study suggest that income inequality exerts positively and significantly on economic growth in Japan, USA, and China. This implies that inequality in income distribution is growth spurring in these economies. However, income inequality exerts an insignificant negative impact on economic growth in South Korea. Results from meta-regression analysis by Neves et al. (2016) indicate certain cogent and slightly divergent submissions. Neves et al. (2016) find that quality of data on inequality, the technique of estimation, and the specification of the growth models are not significant factors influencing the estimation of effect sizes. In addition, the inclusion of regional dummies in the estimation of growth models weakens such effect while the use of expenditure-based and gross inequality results in diverging estimates of the effect size. Furthermore, they deduced that income inequality is less noxious to subsequent growth than land and human inequality are while cross-sectional studies tend to report a stronger negative effect of inequality than panel studies. Neves et al. (2016) submit that the effect of inequality is negative and graver in poor countries than in rich countries. Regional inequality was also found to have an inverted U-shaped relationship with economic development in Spain (Tirado et al., 2016). This was established between 1860 and 2010. An upward trend was observed between 1860-1920 while a strong downward trend was observed between 1960 and 1980. Table 1 provides a summary of these studies. It is obvious that several controversies still exist in the empirical literature on the effect of income inequality on economic growth in terms of magnitude, nature of economies (developed/less developed), the inclusion of regional dummies, quality, and nature of data on income inequality, and the estimation techniques.

Table 1. Synthesis of Empirical Studies on the Effect of Income Inequality on Economic Growth

S/N	Authors/Year	Sample/Data Structure	The measure of Income Inequality	Estimation Method	Effect of Income Inequality on Economic Growth
1.	Perotti (1992)	40 democratic countries, cross section (1970-1985)	The income share of the third quintile; income share of the top quintile	Instrumental variable	Positive for poor countries and negative for rich countries
2.	Alesina and Rodrik (1994)	46/70 countries (1960-1985); cross-section	Gini index	OLS; 2SLS	Negative for the entire sample
3.	Persson and Tabelini (1994)	56 countries (1960-1985); cross-section	Share of the fourth quintile	OLS; 2SLS	Negative for the whole sample but insignificant in non-democratic
4.	Clarke (1995)	74/81 countries (1970-1988); cross-section	Gini index; Theil index; coefficient of	OLS; WLS; 2SLS	Negative for the whole sample (for democratic &

S/N	Authors/Year	Sample/Data Structure	The measure of Income Inequality	Estimation Method	Effect of Income Inequality on Economic Growth
			variation; share of the 4th quintile		non-democratic)
5.	Birdsall et al. (1995)	8 East Asia economies (1960-1990); cross-section	Ratio of total income of top 20 percent	OLS	Low inequality is desirable for a higher growth rate (i.e. inverse relationship)
6.	Perrotti (1996)	67 countries (1960-1985); cross-section	Shares of the third & fourth quintile	OLS WLS	Negative for the whole sample but insignificant with the inclusion of regional dummies
7.	Birdsall and Londono (1997)	43 countries (1960-1992); cross-section	Gini index	OLS	Negative for the entire sample
8.	Partridge (1997)	48 US States (1960-1990); panel	Gini index; Income share of the middle quintile	OLS; 2SLS	Positive for the whole sample
9.	Deininger and Squire (1998)	66/87 countries (1960-1992); cross-section	Gini index	OLS	Negative for the whole sample but insignificant with the inclusion of dummy variables
10.	Li and Zou (1998)	46 countries (1960-1990); Panel	Gini index	Fixed Effects & Random Effects	Positive for the whole sample
11.	Deininger and Olinto (2000)	31/160 countries (1966-1990), panel	Gini index	System-GMM	Negative when only land inequality is considered but positive when both income and land inequality are considered
12.	Forbes (2000)	45 High- & Middle-income countries (1966-1995) panel	Gini index	Arellano & Bond GMM	Positive for both middle- and high-income countries
13.	Barro (2000)	84 countries (1965-1995) panel	Gini index	3SLS; seemingly unrelated regression (SUR)	Negative in poor nations & positive in rich nations but insignificant for the whole sample
14.	Castello & Domenech (2002)	67/83 countries (1960-1990) cross section	Gini index	OLS	Negative for the full sample but positive when income and human capital inequality are considered simultaneously
15.	Panniza (2002)	48 US states (1940-1980) panel	Gini index & Income share of the third quintile	OLS; Fixed effect & Diff. GMM	Negative but insignificant; small differences in the method used can result in large differences in estimated relationship
16.	Chen (2003)	43 countries (1970-1992) cross-section	Gini index	OLS	Inverted-U for the entire sample
17.	Banerjee and Duflo (2003)	45 countries (1965-1995) cross –section	Gini index	Kernel regression	Negative
18	Lundberg & Squire (2003)	38 countries	Gini index	Pooled OLS, 3SLS	Positive
19	Krongkaew & Kakwani (2003)	Thailand 1960-2000	Gini index; Quintile income share	Descriptive analysis	Negative
20.	Pagano (2004)	40 countries (1958-1998) panel	Gini index	Fixed effects; GMM: Granger causality	Negative for whole sample; positive for rich nations and negative for poor nations
22.	Bleaney and Nishiyama (2004)	42/69 countries (1965-1990); cross-section	Gini index	OLS	Positive or negative, depending on the growth regression specification
23.	Knowles (2005)	40 countries (1960-1990); cross section	Gini index	OLS	Negative for the entire sample; negative for low-income countries but insignificant for high/middle-income countries

S/N	Authors/Year	Sample/Data Structure	The measure of Income Inequality	Estimation Method	Effect of Income Inequality on Economic Growth
24.	Voitchovsky (2005)	21 developed countries (1975-2000) panel	Gini index; 90/75 percentile ratio; 50/10 percentile ratio	System GMM	Positive at the top of inequality distribution but negative at the bottom of inequality distribution
25.	Bengoa and Sanchez-Robles (2005)	19/10 countries (1975-1995) cross-section panel	Gini	OLS; Fixed Effects; Random effects; GMM	Positive for rich countries and hump-shaped (i.e. U-shaped) for low-income (Latin American) countries
26.	Barro (2008)	(1960-2000) cross-section	Gini, lowest & highest quintile income shares	3 SLS; Seemingly unrelated regression SSUR	Negative for the whole sample, but tends to be positive for rich nations.
27.	Qin et al. (2009)	Chinese provinces 1992 Q1- 2003Q4; panel	Theil coefficient	Model simulations	Negative
28.	Castello-Climent (2010)	102/56 countries (1960-2000); panel	Gini; Distribution of education by quintile	System GMM	Negative for the entire sample; Positive for rich countries and negative for poor nations. Human capital inequality is also negative for the whole sample, inconclusive for rich countries & negative for poor nations
29	Charles-Coll (2010)	108 countries (1960-2000); cross-section	Gini index	System GMM; 3SLS; Seemingly unrelated regression (SUR)	Inverted-U shaped (i.e. non-linear) based on GMM estimation.
30	Yue (2011)	Korea (1980-2000)	Gini index	OLS, ECM	Negative
31	Herzer & Vollmer (2012)	46 countries (1970-1995); Panel	Estimated Household Income Inequality (EHII)	Heterogenous panel cointegration technique	Negative for the whole sample; Negative for developing and developed countries
32	Akpoilih and Farabiyi (2012)	Nigeria (1960-2010)	N/A	Descriptive analysis	Inequality poses a challenge to the growth
33	Binatli (2012)	1960-1999; 42 countries	Gini index; Income quintile	OLS regression	Negative in the seventies; Positive in the nineties
34	Muinelo-Gallo and Roca-Sagales (2013)	21 high-income OECD countries (1972-2006); Panel	Net Gini	SUR; 3SLS	Positive for the whole sample
35	Ncube et al. (2013)	The Middle East and North Africa (MENA) (1985-2009) cross-section	Gini index	OLS	Negative for the whole sample
36	Chan et al. (2014)	China Provinces	Gini index	VAR; System GMM	Positive
37	Charles-Coll (2014)	Mexican states; 138 countries (1955-2005);	Gini index	SUR & 3SLS; GMM	Panel: Negative for whole Mexico: Negative
38	Davtyan (2014)	US, Canada & UK (1960-2010)	Gini index	Structural VAR	Positive for UK; negative for US & Canada
39	Ostry et al. (2014)	90 countries (1960-2010); panel	Market & Net Gini	System GMM	Negative
40	Halter et al. (2014)	90 countries (1966-2005); panel	Gini index	Diff. GMM; System GMM	Positive for the whole based on diff. GMM; Negative in poor countries & Positive in rich countries based on sys-GMM
41	Cingano (2014)	31 OECD countries (1970-2010); panel	Net & Gross Gini	System GMM	Negative for the whole sample
42	Wahiba and Weriemmi (2014)	Tunisia (1984-2011)	Gini index	OLS	Negative
43	Dabla-Norris et al. (2015)	156/159 countries (1980-2013)	Net Gini; 1^{st} -5^{th} income quintiles	System GMM	Negative
44	Matti (2015)	55/134 countries	Gini index	OLS	Negative for the whole

S/N	Authors/Year	Sample/Data Structure	The measure of Income Inequality	Estimation Method	Effect of Income Inequality on Economic Growth
		(2002-2012)			sample
45	Bagchi and Svejnar (2015)	59 countries (1988-2007); panel	Gini index	Fixed effects & Random effects	Positive but insignificant
46	Carvalho and Rezai (2015)	United States (1967-2010)	Gini index	Threshold Vector Auto-regression (TVAR)	High-income inequality detrimental to aggregate demand
47	Babu et al. (2016)	29 Emerging economies (1980-2008)	Market Gini	System-GMM	Negative in both short-run and long-run
48	Li et al. (2016)	27 Chinese provinces (1984 to 2012)	Per capita urban-rural ratio	Mean Group, Pooled Mean Group; Dynamic Fixed Effects	Income inequality exerted positively on economic growth in the long run
49	Neves et al (2016)	28 studies (1994-2014)	N/A	Meta-regression	A negative effect of inequality more pronounced in DCs than LDCs
50	Hakura et al. (2016)	8/121 countries (1995-2014); panel	Net Gini; the ratio of the top 20 to the bottom 40 percentiles and others	System GMM	Negative for the whole sample; Negative for emerging & developing countries
51	Tongur and Elveren (2016)	82 countries (1988-2008)	UTIP[1] & UNIDO[2] - Industrial Pay Inequality	System GMM	Inequality has a negative direct effect on economic growth
52	Tirado et al. (2016)	Spain (1860-2010)	Gini index	Descriptive analysis & probability models	Inverted-U relationship
53	Yang and Greaney (2017)	China, Japan, South Korea & US	Gini index	Engle-Granger two-step ECM	Positive for China, Japan & US; but negative for Korea
54	Kennedy et al. (2017)	8 Australian States (1986-2013); panel	Gini index	OLS; GMM	Negative for the whole sample
55	Madsen et al. (2018)	21 OECD countries	Gini index	OLS, 2SLS	Inequality has a negative direct effect on economic growth
56	Breunig and Majeed (2020)	152 countries; 1956-2011	Gini index	Difference GMM	Inequality exerts negatively growth through interaction with poverty

1. University of Texas Inequality Project
2. United Nations Industrial Development Organization

Methodology

Model Specification

In line with Cingano (2014), the baseline equation for estimating the effect of income inequality on economic growth could be expressed as:

$$y_{i,t} - y_{i,t-\backslash} = a_{.} + \alpha y_{i,t-\backslash} + \beta X_{i,t} + \gamma INQE_{i,t} + \mu_i + \varepsilon_{i,t} \quad (1)$$

Where *i* denotes a particular country and *t* is the respective period, *y* is per capita GDP, with ($y_{i,t} - y_{i,t-1}$) is the growth rate of per capita GDP, *INEQ* is the measure of income inequality and *X* is a vector of control variables that could also explain the variation in the growth rate of GDP. For this study, we used per capita GDP to measure economic growth. Hence, equation 1 is re-specified as:

$$y_{i,t} = a_{.} + \alpha y_{i,t-\backslash} + \gamma INQE_{i,t} + \beta X_{i,t} + \mu_i + \varepsilon_{i,t}. \quad (2)$$

The coefficient γ captures the direct effect of income inequality on economic growth. X captures some other variables that influence economic growth in the region. These are labor force, capital, inflation, exports, imports, and urbanization.

Estimation Technique

We tested for the stationarity of the series using the panel unit tests developed by Levin, Lin, and Chu (2002), and Im, Pesaran, and Shin (2003). Though, this is not a pre-condition for either the difference or system generalized method of moments (Roodman, 2009).

With the nature of this model, the OLS is not appropriate as it produces inconsistent, biased estimates and produces invalid inference due to problems of endogeneity and measurement errors (Deininger and Olinto, 2000; Voitchovsky, 2005; Baltagi, 2005). In addition, empirical studies on inequality-growth nexus have shown that the relationship is plagued with reverse causality i.e. GDP dynamic feedback to income inequality. In line with Forbes (2000), Voitchovsky (2005), Castello-Climent (2010), Cingano (2014), and Grundler and Scheuermeyer (2018), and relying on the procedure of Arenallo and Bond (1991) of first-differenced GMM, the models were first-differenced to control for the measurement error and the inherent endogeneity problem.

$$y_{i,t} - y_{i,t-1} = a_. + \alpha(y_{i,t-1} - y_{i,t-2}) + \beta(X_{i,t} - X_{i,t-1}) + (\pi_{i,t} - \pi_{i,t-1}) \quad (3)$$

Using Δ as the difference operator, 3 becomes:

$$\Delta y_{i,t} = a_. + \alpha \Delta y_{i,t-1} + \beta \Delta X_{i,t} + \Delta \pi_{i,t} \quad (4)$$

This procedure removes the unobserved country-specific effects σ_i. This allows for the use of lagged values of both $X_{i,t}$ and $y_{i,t}$ as instruments. While the difference-GMM has this advantage, the persistent first differencing causes elimination of the variation in data on variables. This results in biases and loss of precision as the lagged levels of the explanatory variables become weak instruments (Cingano, 2014). Hence, this study employs the system GMM of Blundell and Bond (1998).

The Blundell and Bond (1998) estimator involves the use of both lagged level observations and lagged differenced level observations as instruments. It builds a system of two equations: the original equations and the transformed equation (Roodman, 2009). The *xtabond2* command in Stata was used to implement this estimator. With this feature, the system GMM offers more instruments than the difference GMM, thereby providing a potentially large number of instruments i.e. instrument proliferation. This over fits the endogenous variables (Grundler and Scheuermeyer, 2018). As suggested by Roodman (2009) and Grundler and Scheuermeyer (2018), this study uses collapsed matrix (with the aid of the *collapse* command in Stata) and tested for over-identification (i.e. when instruments are greater than the endogenous variables). By default, the probability values of both the Sargan (1958) and Hansen (1982) tests for over-identifying restriction are contained in estimation results from Stata. Therefore, the higher the probability value of these tests the better. However, the Sargan test is not robust to heteroscedaticity or autocorrelation (Roodman, 2009). Hence, Hansen statistic is more reliable. The Arellano-Bond test for autocorrelation, AR(1) i.e. first-order autocorrelation, and AR(2) i.e. second-order autocorrelation, are applied to the differenced residuals and have null hypothesis of no autocorrelation. The test for AR(1) process in first differences usually rejects the null hypothesis. This is expected because both $\Delta\varepsilon_{it} = \varepsilon_{it} - \varepsilon_{i,t-1}$ and $\Delta\varepsilon_{i,t-1} = \varepsilon_{i,t-1} -$

$\varepsilon_{i,t-2}$ have $\varepsilon_{i,t-1}$. However, the AR(2) is more vital as it detects autocorrelation in levels and the probability value of AR(2) must not be significant. Otherwise, our estimates will not be reliable. It is also required that the instruments should be less than or equal to the cross-sections.

Data and Sources

The study covers thirty-one (31) Sub-Sahara African countries from 1995-2015:

Burkina Faso, Cape Verde, Cote d'Ivoire, Ghana, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, and Sierra Leone (in West Africa); Burundi, Ethiopia, Kenya, Mauritius, Rwanda, Seychelles, Tanzania, Uganda, Zambia, Malawi, and Madagascar (in East Africa);

Angola, Central Africa Republic, and Cameroon (in Central Africa); Botswana, Lesotho, Namibia, South Africa, and Swaziland (in Southern Africa). Data on income inequality are available for most SSA countries between 1995 and 2015. We used Stata 15.0 in estimating our models.

Table 2. Sources of Data, Description, and Measurement of Variables

Variable	Description	Measurement	Source (s) of Data
INEQ	Market Gini	Gini index of inequality in equivalized household (pre-tax and pre-transfer) income	Standardized World Income Inequality Database (SWIID)
Y	GDP per capita	The income per head for individuals in the population is obtained as the GDP divided by the total population	WDI
K	Physical capital	Gross fixed capital formation	WDI
L	Labor Force	Total Labor force	WDI
INF	Inflation Rate	Consumer prices (annual %)	WDI
EXP	Exports	Exports of goods and services	UN Database
IMP	Imports	Imports of goods and services	UN Database
UBR	Urbanization	Urban population	WDI

Data on Income Inequality

Earlier cross-country studies on income inequality-growth nexus have been majorly criticized based on the quality and non-comparability of data. To address this problem, this study used data on income inequality from the Standardized World Income Inequality Database (SWIID). Income inequality data from SWIID have several advantages over data from World Income Inequality Database (WIID), the Luxemburg Income Study (LIS), and other similar sources. The SWIID offers data drawn from a large number of sources across the world including national statistical offices, cross-national inequality databases (including WIID and LIS), and scholarly articles (Solt, 2016). It provides data on both the market Gini and the net Gini inequality for 192 countries from 1960 for 5119 country-years compared to 232 observations for 41 countries available from LIS. Given the limited scope of countries and years covered by LIS, it affects the applicability of the system GMM (Grundler and Scheuermeyer, 2018). Many of the cross-national data on income inequality from other sources are not comparable as they are fraught with problems of differences in the population covered (concerning age, employment status, and geography), equivalence scale used (e.g. household per capita), and the definition of welfare employed (Solt, 2016). Income inequality data from both WIID and LIS have less coverage and lower comparability for cross-country studies, especially studies involving developing countries. Based on these features, SWIID has been a source of data in quite several recent and notable studies relating to income inequality. Therefore, this study relies on income inequality data from SWIID.

Results and Findings

Table 3 shows the degree of association among the variables. Some of the signs do not ordinarily conform to theoretical expectations. Capital, labor, exports, imports, and inflation have an inverse relationship with gross domestic product. Labor, capital, and exports are expected to have a positive sign. Urbanization and the Gini index have a positive association with growth. Most of these relationships are significant. It is however crucial to be extremely cautious in interpreting results from correlation as simple bivariate correlation in a conventional matrix does not normally consider each variable's correlation with all other explanatory variables.

Table 3. Correlation Matrix

	Gross Domestic Product	**Gini Index**	**Capital**	**Labor**	**Urbanization**	**Exports**	**Imports**	**Inflation**
Gross Domestic Product	1.000							
Gini Index	0.205 (0.000)	1.000						
Capital	-0.165 (0.000)	-0.1555 (0.000)	1.000					
Labor	-0.043 (0.000)	-0.113 (0.004)	0.407 (0.000)	1.000				
Urbanization	0.185 (0.000)	-0.004 (0.917)	0.374 (0.000)	0.751 (0.000)	1.00			
Exports	-0.129 (0.000)	-0.176 (0.000)	0.828 (0.000)	0.479 (0.000)	0.569 (0.000)	1.00		
Imports	-0.192 (0.614)	-0.173 (0.000)	0.894 (0.000)	0.252 (0.000)	0.240 (0.000)	0.868 (0.000)	1.00	
Inflation	-0.020 (0.613)	0.017 (0.666)	-0.021 (0.600)	-0.001 (0.982)	-0.004 (0.924)	-0.023 (0.565)	-0.023 (0.566)	1.00

Source: Research finding.
Values in parenthesis are probability

Table 4. Unit Root Tests

Variable	**Levin-Lin-Chu (LLC) Test**		**Im-Pesaran-Shin (IPS) Test**	
	Level	**Difference**	**Level**	**Difference**
Gini Index	51.1794	-12.7029***	5.0223	-9.4949***
GDP per capita	-3.3208***		0.7292	-11.0379***
Physical Capital	2.2163	-10.5719***	3.0076	-10.2409***
Labour Force	2.2972	-7.3063***	7.3467	-2.3556**
Inflation	-13.5134***	-16.1008***	-10.2409***	-16.1008***-
Exports	0.5618	-15.2054***	-1.2546	-14.1368***
Imports	2.9609	-10.9098***	3.4175	-11.6475***
Urban Population	-3.7879***	-8.7910***	4.0110	-2.2019**

Source: Research finding.
* p < 0.10, ** p < 0.05, *** p < 0.01

The results from both the Levin-Lin-Chu (LLC) test and the Im-Pesaran-Shin (IPS) test indicate that virtually all the variables are stationary at first difference. However, inflation is stationary at the level for both the Levin-Lin-Chu (LLC) and the Im-Pesaran-Shin (IPS) unit root tests.

As shown in Table 5, the coefficient of the Gini coefficient is not only negative but also

statistically significant at 5 percent. This indicates that higher dispersion in income distribution in the SSA region exerts negatively on economic growth. Our results suggest that both capital and labor contribute positively to the growth process, with the capital being statistically significant at 1 percent. This illustrates that capital contributes more substantially to growth. We find that a 1 percent increase in capital translates to about a 0.05 percent increase in the gross domestic product.

The results also reveal that rural-urban migration contributes adversely to growth, as the coefficient of urbanization is negative and statistically significant at 5 percent. This is quite plausible since most economies in Sub-Saharan Africa are dichotomous i.e. into rural and urban sectors, but with few cities and many villages, with a larger percentage of the population preferring to reside in the cities as the rural areas lack basic infrastructure. This causes over-population in the urban areas, with attendant effects like unemployment, high crime rates, and other growth-inhibiting factors. Meanwhile, the coefficient of exports is positive and statistically significant at 5 percent while the coefficient of imports is negative and statistically at 1 percent. This is not surprising as most economies in the region are net food importers and import-dependent. Countries like Nigeria, Niger, among others, rely heavily on imports while they export less.

The results indicate a relatively larger coefficient for imports, with a 1 percent increase in imports culminating into a 0.1 percent diminution in growth. This indeed crowds out the expected positive effect of exports on economic growth in the region.

Table 5. Effect of Income Inequality on Growth

Dependent Variable	**Gross Domestic Product**
Lagged gross domestic Product	1.0054* (0.0107)
Gini index	-0.0008** (0.0003)
Capital	0.0534* (0.0186)
Labour force	0.0065 (0.0086)
Urbanization	-0.0240** (0.0095)
Exports	0.0546** (0.0206)
Imports	-0.1056* (0.0370)
Inflation	0.00002 (0.00002)
Cross-sections	31
Instruments	26
Hansen Test	0.302
Sargan Test	0.221
AR (1)	0.033
AR (2)	0.261

Source: Research finding.
The values in parentheses are the standard error.
The values for the AR (1), AR (2), and the Hansen test are the p-values.
* ,** denote 1% and 5% levels of significance.

Meanwhile, the coefficient of inflation is positive and statistically insignificant. This may be quite implausible as high inflationary, as prevailing in the region, should be growth-inhibiting. High inflation tends to cause disincentives to save and invest.

Table 6. Panel Granger Causality Test

Null Hypothesis	**F-Statistic**	**Prob.**
Gini Index does not Granger cause GDP per capita	6.4405	0.0114

GDP per capita does not Granger cause Gini Index	2.3968	0.1222

Source: Research finding.

Results in Table 6 show that a unidirectional relationship exists between income inequality (measured by Gini Index) and economic growth (measured by GDP per capita), with causality running from Gini index to GDP per capita. This corroborates the finding drawn from the system GMM estimation indicating that income inequality exerts significantly on economic growth in the SSA region.

Robustness Check

For the robustness check, it is more appropriate to use another measure of income inequality (like Theil's Index, Atkinson's index), estimated using another econometric technique. However, data on these alternative measures of income inequality are not readily available in SSA countries. Hence, we used the two-stage least squares (2SLS), a less efficient instrumental variable method to the generalized method of moments (GMM). The results are in Table 7.

Table 7: Estimates from 2SLS
Dependent Variable: Gross Domestic Product

Gini index	-3.4087* (1.1450)
Capital	-3.1796* (0.7751)
Labor force	1.1876*** (0.7030)
Urbanization	-0.6911 (1.0387)
Exports	2.5555*** (1.3917)
Imports	3.9228* (0.8345)
Inflation	-0.2577* (0.0838)

Source: Research finding.
The values in parentheses are the standard error.
*, *** denote 1%, and 10% levels of significance.

Based on the alternative estimation approach, results in Table 7 indicate that the coefficient of the Gini index is negative and statistically significant at 1 percent. Income inequality still has a pernicious effect on economic growth. The results also show that inflation, imports, and capital accumulation markedly determine growth potentials in Sub-Saharan Africa.

Discussion and Implications of Findings

The growth model indicates a significant negative effect of income inequality on economic growth in the SSA region. This finding suggests that income inequality is detrimental to economic growth in the SSA region. The outcome of this study is consistent with findings from Alesina and Rodrik (1994); Clarke (1995); Birdsall and Londono (1997); Deininger and Squire (1998); Barro (2000); Banerjee and Duflo (2003); Pagano (2004); Castello-Clement (2010); Yue (2011); Herzar and Vollmer (2012); and Ncube et al., 2013. Similar studies include Charles-Coll (2014); Ostry et al. (2014); Cingano (2014); Matti (2015); Dabla-Norris (2015); Babu et al. (2016); Hakura et al. (2016); Tongur and Elveren (2016); Kennedy et al. (2017) among others. All these studies affirm that inequality in income distribution is growth-impeding. Specifically, Barro (2000), Pagano (2004), Barro (2008), Knowles (2005), Castello-Climent (2010), Halter et al. (2014), and Neves et al. (2016), found the direct effect of income inequality to be negative for the poor countries while it is positive/insignificant for the rich countries. The finding from our study is however contrary to those of Perotti (1992), Patridge (1997), Li and Zou (1998), Forbes (2000), Lundberg and Squire (2003), Muinelo-Gallo and

Roca-Sagales (2013), Chan et al. (2014), Bagchi and Svejnar (2015) and Li et al. (2016). These studies found a positive direct effect of income inequality on economic growth. Perroti (1992) reported a positive direct effect of income inequality on economic growth for the poor countries and a negative direct effect of income inequality for the rich countries. This is not consistent with finding from the current study. However, it is vital to reiterate that the adverse effect of income inequality on economic growth is possibly strengthened by the high incidence of poverty in the SSA region. Breunig and Majeed (2020) surmised that the negative impact of inequality in income distribution tends to be stronger in poor economies. This submission is quite valid in the context of the current study as many Sub-Sahara African countries rank among the poorest in the world. It is therefore desirable for future studies on SSA to examine if the deleterious effect of inequality on growth is traceable to its interaction with poverty as contended by Breunig and Majeed (2020).

Our results have significant policy implications. High-income inequality results in unequal access to credit facilities, with the disproportionately poor individuals having fettered access to investment opportunities. This hampers growth. It is also evident that government policies on redistribution have not effectively promoted economic growth. It, therefore, implies that government needs to initiate interventions and fiscal policy actions that will attenuate the adverse effect of income inequality on the growth process in the SSA. However, the main puzzle is how to reduce income inequality without undermining growth. If the government relies on higher taxes as a potent fiscal instrument for reducing inequality, this could create a disincentive for saving and investment, thereby inhibiting growth in the long run. Hence, it is expedient to specifically identify channels through which income inequality impacts economic growth. Since these channels are likely to differ across economies, then studies in this direction should be carried out at the country level. It is also apt to note that government needs to be cautious in focusing too much on pro-growth policy, with the notion that its benefits will automatically trickle down to every individual in the society. This seems questionable as this policy may even raise the level of income inequality. Of course, growth as a rising tide may not lift all boats.

Our findings also have consequences on the achievement of Goal 10 of the Sustainable Development Goals (SDGs) of reducing inequality within and among countries. These findings suggest that the SSA region may be far from achieving this goal given the ubiquity and severity of income inequality in the region.

Conclusion

This paper investigates the effect of income inequality on economic growth for a panel of 31 Sub-Saharan African countries over 21 years. By estimating a system GMM model, we find that income inequality exerts a significant negative effect on economic growth. The core finding is also shown to be robust to the alternate estimation method. The results from the two-stage least squares (2SLS) method also suggest that income inequality impedes economic growth in the region. It is also deducible that inflation, international trade, capital formation, aside from income inequality are core determinants of the growth process in the SSA region. Therefore, policies aimed at reducing income inequality should pay key attention to issues relating to capital accumulation, prices of domestic goods and services, and openness since they are complementary to income inequality in influencing growth in SSA. One major inference is that lowering inequality in income (i.e. a more equitable dispersion of income) is likely to be more beneficial for the growth process via the intrinsic positive impact of higher average income cum standard of living.

Although our study offers little or no explanation on the channels of effects of income inequality on economic growth in SSA, redistribution as the policy of the government should

aim at alleviating the challenges of human capital accumulation for the disproportionately poor. This is imperative as human capital is the *sine qua non* for the modern growth process.

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