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Growth and Inequality in Africa: Reconsideration

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Abstract *Considering the recent interest in the need to curb inequality and enhance economic growth as a tool for fighting poverty in Africa, we employ a panel of 20 African countries. The paper empirically examines the determinants of growth and income inequality and the channel through which growth determinants influences income inequality. The study is restricted to the period 1991 to 2015 based on data availability. We employ Panel Fixed Effect (PFE) models to investigate growth-inequality relationships and find that, there exists a positive long-run relationship between growth and inequality in the selected African countries. For causality analysis, we employ Dumitrescu and Hurlin (2012) Granger causality for heterogeneous non-causality test approach, where we found neutrality hypothesis between growth and income inequality, and between foreign direct investment and inequality, while between other regressors all with a feedback. The results suggest that population growth; mortality rate, government consumption expenditure and foreign direct investment are principal determinants of the long-run growth and income inequality within the selected African countries.*

Key words Economic growth, income inequality, panel data, Africa

JEL Codes: C33, N17, O55

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1. Introduction

In the word of Robert Lucas (1988) the issue regarding economic growth is so interestingly crucial that, once one starts thinking about it, it might be difficult to think of something else. Cowen (2002) posits that growth is important because it helps one to take a further look into the future. According to Simon, Jonathan and Arvind (2010) common perception has long been inverse on Africa growth. Africa has conventionally been considered as a nation destined to stay in penury, either due to its deep-seated corrupt practices or ethno-linguistic fractionalization. Though the exact mechanism differs, but the basic argument has been that Africa's economic potentials are obtuse as its effect on the living standard of a common man is not evident. The fact remains that Africa has performed poorly, not just over the last decades, but since the 19th century, which marks the inception of modern economic growth theory. It is incontestable that a considerable number of African countries are presently doing well, but the argument rather lies whether they are putting in place, policies to sustain the present economic situation and the future to come.

Inequality according to Babu *et al.* (2016) is an indicator of insufficiency of income mobility which has consequential implications for macroeconomic stability and growth. Pew Research Center (2014) argues that the widening gap between the poor and the rich is the utmost difficulties the world is facing. Dabla-Norris *et al.* (2015) refer to it as the "defining challenge of our time" they argue critically against the "economy of exclusion". In Africa, related trend is also getting the growing concern. Income inequality is widening with the negligible population becoming richer while the class of the poor getting wider. Ignoring inequality issues in the hunt for development is risky. Paying more attention to policies that enhance income generation and economic growth is unproductive, as this would only lead to accumulation of more wealth for the few rich and throw the masses into abject poverty. Failure to combat inequalities would make the African nations stay vulnerable to economic, social and political turbulence.

The extant literature on the growth-inequality relationship is vast and has capitulated extensive conflicting outcomes. Some authors found positive relationship (see Lopez, 2006; Frank, 2009; Chan *et al.* 2014; Saari *et al.,* 2015) some negative relationship (see Perotti, 1996; Wan *et al*., 2006; Sukiassyan, 2007; Nissim, 2007; Majumdas and Partridge, 2009; Ogus Binatli, 2012) inconclusive (see Barro, 2000) and mixed relationship (see Chambers, 2010; Chen, 2012; Inyong, 2012; Huang *et al.*, 2015) the reasons behind these conflicting findings are not far-fetched. Empirically, different data sets, estimation techniques or model specifications have been proposed as a feasible explanation for the divergent results in the existing literature.

This study extends existing literature on growth and inequality following the work of Odedokun and Round (2004) where they investigate the determinants of income inequality and the medium through which inequality influence economic growth in the context of African countries. They identified some factors that affect income inequality, which includes size of the

government budget, regional factors, the level of economic development, business cycle, contribution of the labor force in agricultural sectors and land/human resources endowment. Evidence was found that high level of inequality would inversely affect the level of growth. However, major macroeconomic variables, such as mortality rate, government consumption expenditure and foreign direct investment, that impact directly or indirectly on the common man in Africa was not captured in their model. It is on this premise, we seek to fill the gap in the literature, by incorporating and examining these macroeconomic variables and their effects on income inequality for selected African countries.

In contrast to the past studies using African data, we focus on investigating specific macroeconomic variables that most of the existing studies have not been paying attention to when analyzing the relationship between growth and inequality. In addition, we examine how these macroeconomic variables influence income inequality in selected Africa countries. Basically, we build a panel of 20 African countries over the period of 24 years, using the Panel Fixed Effect (PFE) estimation model. The sampled countries and the time span are restricted on the data availability between the periods of 1991 to 2015. Improving on the work of Odedokun and Round (2004), we employed macroeconomic variables that directly affect lives of a common man, to examine the impact of these variables on growth process and how they influence income inequality of the African countries. In addition, the time coverage of our panel datasets, compare with the previous studies that use Africa data, make our empirical model robust and useful for policy decision making.

2. Literature review

It quite imperative and expedient to understand economic growth and inequalities separately before establishing the relationship thereof. According to Herrick and Kindleberger (1983) economic growth involves the provisions of inputs that lead to greater outputs and improvements in the quality of life of a people. Jhingan (1985) refers to it as a quantitative and sustained increase in a country's per capita output or income accompanied by expansion in its labor force, consumption, capital and volume of trade and welfare (see also Thirlwall, 1972). For this research work, economic growth is defined as substantial and sustained increase in real per capita income emanating from expansion in production capacity. This means sometimes increase in per capita income may not be because of expansion in production capacity but due to inflation. When there is inflation, per capita income rises because the value of goods and services produced by a country increases but not because of expansion in production capacity. For this reason, rise in nominal income per capita is not economic growth. It is until when rise in nominal income per capita after been deflated by GDP deflator translates to sustained increase in real per capita income that a substantial economic growth is achieved. Economic growth is not sustained when national output and population increase at the same pace because there would be no increase in per capita income despite increase in output. Similarly, increase in per capita income because of faster decrease in population than decrease in national output generally result to economic stagnation and not economic growth.

It is quite myopic to restrict inequalities to income inequality. The reason being that, the understanding of inequality has evolved from the traditional income oriented view to broader perspective. As a matter of fact, income inequality is a subset of inequalities. Inequalities as often aptly called economic inequalities are a conglomerate of income inequality, pay or wage inequality and wealth inequality. Hence, inequality is better seen as variation in the distribution of income, pay and wealth manifesting in form of difference in social status of an individual. While establishing the relationship between economic growth and inequalities among African countries, the concept of immiserizing growth cannot be exonerated. Most African countries experience growth that depletes the welfare of large number of people while the wealth of selected few rises. This is within the purview of immiserizing growth.

Kuznets (1955) study on the relationship between economic growth and income inequality has been the reference point for most of the researchers in this field of study. Kuznets conducted the analysis on two giant industrialized economies of the United Kingdom and Germany, where the empirical findings (on inverted U curve) was centered on the hypothesis that income inequality rose in the wake of industrialization process and later declined as development process increases. Surprisingly, Kuznets could not give enough empirical evidence for evaluating this hypothesis of a long temporal swing in income inequality neither can the phases be specifically dated. However, Anand and Kanbur (1993) provided an explanation for the increasing income inequality in developing countries. Consequently, it becomes expedient and of great importance to always take a closer look at Kuznets exposition (hypothesis) and cautious when analyzing the relationship between income inequality and growth.

The existing literature on the growth and income inequality relationships can be divided into 4 groups. The first group are set of authors who investigate income inequality and growth and found positive relationships (see Benabou, 2000; Deininger and Olinto, 2000; Lopez, 2006; Frank, 2009; Chan *et al.*, 2014; Wahiba and El, 2014; Hederson *et al.*, 2015; Saari *et al.*, 2015; Babu *et al.*, 2016; Nasr *et al.*, 2018). The second set of authors work on the growth-inequality relationship and found negative relationship (see Alesina and Rodrik, 1994; Perotti, 1996; Deininger and Squire,1998;

Knowles, 2005; Ostry *et al.*, 2014; Wan *et al.*; Sukiassyan, 2007; Nissim, 2007; Majumdas and Partridge, 2009; Ogus Binatli, 2012; Fang *et al.*, 2013; Muinelo and Roca, 2013; Rubin and Segal, 2015; Balcilar *et al.*, 2018) The third group conclude that the relationship between growth and income inequality is inconclusive (see Barro, 2000) while the last group posits a mixed relationship between growth and income inequality (see Chen, 2002; Voitchovsky, 2005; Inyong, 2012). The summary of the literature survey is reported in Table 1.

Persson and Tabellini (1994) in their analysis use equality rather than inequality index for 9 developed countries and arrive at negative impact between equality and growth, while Alesina and Rodrik (1994) found an inverse relationship between wealth/income inequalities on growth. Ostry *et al.* (2014) on the other hand, in historical context, found a negative linear relationship between growth and inequality, using a cross-country data. Perroti (1996) also confirmed this negative impact of inequality on growth debate. Nevertheless, Deininger and Squire (1998) refute Kuznets's findings in their longitudinal data analysis relationship between inequality and growth, while Banerge and Duflo (2003) challenge the foist linear structure of Deininger and Squire (1998) re-established the nonlinear form and conclude that variation in inequality towards any direction (either positive or negative) are related with lesser future growth rate.

There have been some considerate studies on growth-inequality relationships in Africa. Odedokun and Round (2004), uses data from 35 African countries for the period of 40 years to investigate factors that determine income inequality and its impact on economic growth of African nations. The study employed Ordinary Least Square (OLS) estimation techniques. It was discovered that, an increase in income inequality has an adverse effect on growth. According to the study, the size of the government budget, share of agricultural sector in growth, land and human endowment among others were identified as a disturbance factor that spread income inequalities. However, these inequalities have been broadened due to the decline in education both at elementary, secondary and tertiary levels, the frequent political instability that erodes economy stability and high fertility rate.

Moreover, Bhorat *et al.* (2009) in their study for South Africa, focus on income and non-income inequality and its impact on growth, using the data from 1995 and 2000. They discovered an enormous income inequality over the study coverage period. The result of the study also revealed that South Africa is the most consistent unequal economy in the world. The result has lent a support to the negative impact of inequality on growth.

Furthermore, Wahiba and El (2014) empirically investigate the relationship between economic growth and income inequality for Tunisia, using yearly data for a time series analysis between the periods of 1984 to 2011. They found an argument in support of the negative relationship between inequality and growth. According to them, exchange flexibility and economic growth have constituted aggravating factors for inequalities through trade liberalization, while in the quest to curb income inequality; financial development and investment in human capital have played a major role.

In a report of a story carried out by IMF (2011) it was revealed that Sub-Saharan Africa has been experiencing huge level of inequality both in gender and income, with international certainty that, such level of inequality may shackle macroeconomics growth and stability. The findings pointed out that, Sub-Saharan Africa have been battered with higher level of inequality; and for the past 15 years of moderate growth in the region, income inequality has been unchanged. According to the report, the growth-inequality relationships is quite different in the region compare to others, in the sense that, income inequality is perceived huge at all levels of income in Africa than anywhere in the world. Meanwhile, sound economic policies that would reduce income inequality, and accelerate growth process were suggested.

Table 1. Summary of literature survey on income inequality and growth

Authors	Period Coverage	Region	Estimation Technique	Inequality impact on growth	Variables
Babu et al., (2016)	1960-2012	Emerging economies	System GMM	Negative	GDP, Income inequality and redistribution.
Li et al., (2016)	1984-2012	China	Panel ARDL	Positive	GDP PC, capital urban-rural ratio etc.
Yang et al. (2016)	1960-2014	Asia-Pacific Region	Enger Granger two-step approach	S shape	GDP PC, labor force, export, government consumption, investment, fertility.
Hederson et al., (2015)	1965-2003	Cross-country analysis	Panel Parametric and non-parametric model	Negative	AGDP PC, growth rate of gini and data on level of changes in inequality
Rubin & Segal (2015)	1953-2008	United States	Fixed Effect	Positive	GDP growth, gini, stock market return and compensation

Saari et al., (2015)	1970-2000	Malaysia	Input – Output	Positive	GDP PC, labor income and gini coefficient
Ward & Charles (2015)	1990-2009	Cross-country analysis.	MLD and GE	Positive	Gini, GDP PC, population, poverty.
Chan et al., (2014)	1996-2012	China	VAR & System GMM	Positive	RGDP PC, Gini and time dummies
Cingano, F. (2014)	1985-2011	OECD countries	Panel data	Positive	Expenditure on tertiary education, RGDP, Gini
Wahiba & El (2014)	1984-2011	Tunisia	Fixed Effect	Negative	GDP growth, Gini, trade openness
Fang et al., (2013)	1945-2004	United States	Fixed Effect	Positive	Growth volatility, human capital attainment
Muinelo & Roca (2013)	1972-2006	OCDE countries	Panel VAR	Positive	GDP, gini, tax and government transfer.
Inyong Shin (2012)	1990-2007	United States	Theoretical & Heterogeneous model	Inverted U	Capital stock, growth rate, gini, polarization index, output
Ogus Binatli (2012)	1970 -1999	Cross-country analysis	First Generation Panel Model	Negative	GDP PC, AGDP PC. Standard error of the GDP PC, PRIM, SEC, TER, and Govt. expenditure.
Andrew and Jonathan (2011)	1958-1985	Cross-country analysis	Fixed Effect	Negative	RGDP PC, External Debt, FDI, Trade Openness
Frank, M. W. (2009)	1945-2004	United States	Fixed Effect	Positive	RGDP PC, college degree, higher school degree.
Majumdar & Partridge (2009)	1990-2000	United States	Spatial Autoregressive Model	Negative	GDP PC, lagged growth, population, labor force.
Sukiassyan (2007)	1988-2002	Cross-country analysis	Fixed Effect and System GMM	Negative	Gini, political instability, lending rate, inflation rates, RGDP among others.
Lopez (2006)	1970-2000	Cross-country analysis	Panel Pooled and Fixed Effect	Positive	GDP PC, Gini and time dummies
Wan et al., (2006)	1987-2001	China	PIS	Negative	Investment, education, GDP, gini.
Nahum, R. A. (2005)	1960-2000	Swedish countries	OLS	Positive	GDP PC, Gini
Voitchovsky, S. (2005)	1975-1995	European countries	Fixed Effect	Inverted U	RGDP PC, gini etc.
Chen (2002)	1970-1992	Cross-country analysis	Barro	Inverted U	GDP PC, Gini.
Forbes K. J. (2000)	1966-1995	Cross-country analysis	Fixed Effect	Positive	GDPPC, Gini, etc.
Robert J. B. (2000)	1965-1995	Cross-country analysis	3SLS	Inconclusive	Education and fertility, RGDP

3. Methodology of research

This section discusses the data and defines the methodology used in the selection of indicators. We discuss in detail, model specifications and its apriori expectations.

3.1. Data

For the empirical estimation, we built a panel model for the following 20 African countries, Burundi, Burkina Faso, Botswana, Chad, Cameroon, Central African Republic, Cote d'Ivoire, Congo Republic, Ghana, Kenya, Madagascar, Malawi, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Sudan, South Africa, and Togo. Research sample is confined to the period in which annual data are obtainable from 1991 to 2015 (24 observations for each country). Previous empirical study on the growth and inequality in Africa mostly used poverty index to proxy for inequality, partly due to data unavailability. For our study we employ gross domestic per capita growth (GDPC) as a measure of economic growth and gini-index which is a good indicator of income distribution (see Human Development Report, 2015) to proxy for income inequality (INQ). Based on the work of Li et al. (2016), we employ foreign direct investment (FDI), government consumption on expenditure (GCE), mortality rate (MOR) and population growth rate (POPR), which is found to be crucial determinant of growth (see Odedokun, 2004). Data was obtained from the World Bank Database except data of income inequality which was sourced from the Global Consumption and Income Inequality Project (2016) dataset. The summary statistics for the variables of interest is presented as seen in Table 2.

The Pearson correlation coefficient estimates are reported in Table 3. These coefficients are not to be put into consideration for possible relationships that exist between variables, however, they may be used to obtain certain information about the likely signs of the relationship that exist between the variables. The correlation coefficient estimates of INQ to growth, POPR to growth, MOR to growth, GCE to growth, and FDI to growth are estimated as -0.501, -0.527, -0.695, -0.439, 0.629 respectively. These correlation coefficient estimates are all statistically significant at 0.01 and 0.05 significance levels. While the correlation coefficient estimates of the same variables with the INQ index is weaker compared to the correlation coefficients with GRPC. Based on the insignificant correlation estimate between FDI and MOR, we infer that, the indirect influence of foreign direct investment on MOR is presumably not significant in Africa.

Table 2. Summary statistics of the variables

Variable	GDPR	INQ	POPR	MOR	GCE	FDI
Mean	1.817	0.596	2.645	5.352	13.660	3.322
Median	1.644	0.586	2.620	5.322	13.247	1.900
Maximum	37.127	0.868	7.988	7.749	31.572	46.493
Minimum	-37.925	0.488	-1.397	2.363	4.157	-4.852
Std. Dev.	5.060	0.047	0.798	1.181	5.049	5.266
Skewness	0.253	2.929	1.035	-0.289	0.764	3.907
Kurtosis	22.410	16.151	13.380	3.303	3.627	23.861
Jarque-Bera	659.634***	362.95***	196.905***	7.483***	47.774***	868.994***
Probability	0.000	0.000	0.000	0.023	0.000	0.000
Sum	763.1526	250.4639	1111.135	2248.237	5737.329	1395.369
Sum Sq. Dev.	10728.36	0.941873	267.3439	584.8729	10685.16	11621.15
Observations	500	500	500	500	500	500

Note: *Variables are in their level form.*

Table 3. Pearson correlation result

	GDPR	INQ	POPR	MOR	GCE	FDI
GDPR	1.000					

INQ	-0.501	1.000				
t-stat	-4.304	-----				
P-value	0.0037	-----				
POPR	-0.527	-0.277	1.000			
t-stat	-4.260	-5.914	-----			
P-value	0.044	0.000	-----			
MOR	-0.695	-0.293	-0.477	1.000		
t-stat	-5.604	-6.271	-11.114	-----		
P-value	0.026	0.000	0.000	-----		
GCE	-0.439	0.426	-0.108	-0.226	1.000	
t-stat	-4.898	9.642	-2.236	-4.756	-----	
P-value	0.019	0.000	0.025	0.000	-----	
FDI	0.629	-0.148	0.094	-0.009	-0.118	1.000
t-stat	5.289	-3.074	1.945	-0.204	-2.436	-----
P-value	0.007	0.002	0.052	0.838	0.015	-----

Note: *Table reports the estimates of the Pearson correlation coefficient between the pairs of variables. t-stat is the t-statistics for the significance of the correlation coefficient and p-value is its marginal probability.*

3.2. Model

With the objective of exploring the relationships between growth and inequality in Africa, we built fixed-effects model as shown in Eq. (1).

$$Growth_{i,t} = \beta_i + \beta_1 INQ_{i,t} + \beta_2 POPR_{i,t} + \beta_3 MOR_{i,t} + \beta_4 GCE_{i,t} + \beta_5 FDI_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where, in Eq. (1) subscripts i = 1, 2,…, N and t = 1, 2,…, T depicts countries considered and periods, β_i denote country-specific fixed-effect, while $\beta_1,..\beta_5$ slope coefficients of the parameters, and $\varepsilon_{i,t}$ is the error term. In Eq. (1), we expect $\beta_1<0$, $\beta_2<0$, $\beta_3<0$, $\beta_4>0$ and $\beta_5>0$ respectively. The parameter estimate of inequality is expected to be inversely related with growth i.e. $\beta_1<0$. As inequality increases, growth decreases vice versa. The slope coefficient of population growth is also expected to be $\beta_2<0$ i.e. the more the population grows; the less will be per capita income, thus a negative influence of growth. Mortality rate is expected to negatively $\beta_3<0$ impacted on growth, while as government consumption expenditure and foreign direct investment increases, the better would be the growth i.e. $\beta_4>0$ and $\beta_5>0$ respectively. Meanwhile, the major empirical question of the study is the existence of the levels relationship in Eq. (1) and the impact of these determinants on growth and inequality in Africa.

4. Empirical findings

In this section, we discuss and present in tables panel estimation techniques employed, which include the panel unit root tests and choice of panel estimation model, then we critically discuss the research empirical findings.

4.1. Panel unit roots test (PURT)

In order to show that the standard assumption of asymptotic analysis exist in a model, it is crucial to carry out the stationarity tests. The conventional method of testing for stationarity of a series is through unit root tests. However, contemporary studies have proposed that the panel-based unit root tests have higher power compare to individual time series-based unit root tests (see Baltagi, 2005; Hlouskova *et al.*, 2006). There are various tests of unit root that can be used for a panel data analysis. One of these is the Levin-Lin-Chu (2002) they built their unit root test on the assumption that, all individuals possess similar level of integration. Maddala and Wu (1999) came up with a diverse specification of unit roots test, with separate unit roots process. Im *et al.* (2007) also created a similar test.

In Table 4 we report the panel unit root test results. Table 4 show the Maddala and Wu (1999), Levin *et al.* (2002), and Im *et al.*, (2003) panel unit root results for the variables in their level form. From the estimation outcomes, we reject the null hypothesis of a unit root, thus, we conclude that, our variables are stationary at level i.e. *I*(0).

Table 4: Panel unit root tests

Variables	Levin-Lin-Chu	Im-Pesaran-Shin	Fisher-type (ADF)
	Level	Level	Level
GDPR	-12.7435***	-12.2649***	220.135***
INQ	-9.0827***	-3.8044***	84.6982***
POPR	-1.5387***	-3.9276***	165.249***
HEALTH	-8.8457***	-6.4399***	130.8664***
GCE	-3.1944***	-3.9276***	92.0243***
FDI	-3.0232***	-3.3914***	84.1523***

Note: *$Z_{t\text{-}bar}$ is reported for IPS and Z_{stat} for Fisher test. * Significant at 0.01 ** at 0.05 and *** at 0.10 levels.*

Hausman specification (1978) test is a test of hypotheses in terms of inconsistency or bias of an estimator. It is used to evaluate consistency of an estimator, when compared to its alternative estimator, which is known to be more consistent. Hausman specification[1] test is mostly used to distinguish between random effects (RE) model and fixed effects (FE) model in panel data. In this specification, random effects is propose under the null hypothesis, which is due to its higher efficiency, while fixed effects, though less efficient is preferred under the alternative hypothesis due to it consistency. For the test, we reject the null hypothesis of panel random effect, thus we conclude that panel fixed effect model is appropriate for our study.

We report our estimation results in Table 5. From the results reported in column (1) of Table 5 show a positive statistical significant relationship between growth and inequality. To be precise, a 1% increase in income inequality will lead to increasing in the level of growth by 3.9%, significant at 1% level.

[1] Though there has been an argument about using Hausman (1978) test in a choice of model between random effects and fixed effects. The choice of model should be based on author's intuition regarding the properties of the data.

Table 5. Panel fixed-effects model results

Variables	*(1)*		*(2)*	
	Stat	*P.value*	*Stat*	*P.value*
Cons	*0.075***	*0.000*	*0.453***	*0.0000*
	(5.199)		*(415.652)*	
INQ	*0.039***	*0.007*		
	(2.699)			
GDPC			*0.0001***	*0.0000*
			(13.902)	
POPR	*0.069***	*0.000*	*-0.0013***	*0.0000*
	(5.797)		*(-25.894)*	
MOR	*-1.636***	*0.000*	*0.0022***	*0.0000*
	(-7.407)		*(119.473)*	
GCE	*-0.124***	*0.000*	*0.0018***	*0.0000*
	(-5.744)		*(86.100)*	
FDI	*0.063***	*0.000*	*-0.0003***	*0.0000*
	(3.940)		*(-14.074)*	
N	*500*		*500*	
F (6, 20)	*15.35***		*78.36***	
Durbin Watson	*2.067*		*2.041*	
R-squared	*0.436*		*0.597*	
Adj. R-squared	*0.408*		*0.516*	

*Note: variables are significant *** at 0.01 percent level.*

On the other hand, a 1% increase in population will lead to increasing growth by 6.9% in the long-run, significant at 1% level. In addition, a 1% increase in mortality rate will lead to decrease in growth by 1.63, significant at 1% significant level, while 1% increase in government consumption expenditure and foreign direct investment will lead to decrease and increase in growth by 12% and 6.3% in the long-run, both are significant at 1% levels. This is consistent with the findings of Barro (2000), Asiedu (2006) and Li *et al.* (2016). Moreover, the level stationarity of the variables, confirm the existence of a stable long-run equilibrium relationship between the growth, income inequality and its determinants. The sensitivity checks indicate that the model passed the test for heteroscedasticity, functional form and serial correction. The low value of the coefficient of determination for the fixed effects model indicates that the adjustment of the fixed effect model is good (R^2 = 0.436 $\rightarrow$1). In addition, the F-statistic which account for joint significance of the variables (regressors) in the models is statistically significant at 1% level, and finally, the Durbin-Watson statistic for the fixed effect models is roughly equal to 2, which indicate the absence of error serial correlation.

In column (2) of Table 5, we check the robustness of the growth determinants in the column (1) results by regressing the growth determinants on income inequality measure. This is conducted in order to further investigate the roles played by the growth determinants in income inequality within the selected African countries. We re-estimate Eq. (1) with INQ being replaced as dependent variable. The estimated coefficient of a long-run relationship between growth and income inequality is found to be positive and statistically significant at 1% level. This is in contrast with our aprior expectation. It appears that, the level of income inequality within the region do more good than harm.

Based on this result, it will be theoretically right to assume that, as the few rich are getting richer, their production activities increases, thereby raising the level of growth. However, the regressors, i.e. population growth, mortality rate, government consumption expenditure and foreign direct investment shows a statistical significant reverse sign at 1% levels, which is consistent with aprior expectations when compare with growth model.

In order to complement the fixed effect model estimation results, Dumitrescu and Hurlin (2012) Granger causality for heterogeneous non-causality were conducted; the results are presented in Table 6. The statistical insignificant of the Wald statistic indicates that growth and inequality do not Granger cause one another, i.e. there is an existence of a neutrality hypothesis between growth and income inequality. By implication, growth and income inequality do not have predictive power over one another. In addition, we found a bidirectional causality between growth and government consumption expenditure, between population growth and growth, unidirectional causality between growth and foreign direct investment,

between mortality rate and growth and between income inequality and the regressors all with a feedback effect, while we found non-Granger causality relationship between foreign direct investment and income inequality respectively.

Table 6. Panel Granger causality test

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
INQ → GDPR	*1.740*	*-0.871*	*0.383*
GDPR → INQ	*2.734*	*0.827*	*0.408*
GCE → GDPR	*3.462***	*2.072*	*0.038*
GDPR → GCE	*3.499***	*2.135*	*0.032*
FDI → GDPR	*3.625***	*2.349*	*0.018*
GDPR → FDI	*2.220*	*-0.049*	*0.960*
MOR → GDPR	*3.879****	*2.783*	*0.005*
GDPR → MOR	*5.348*	*5.293*	*1.E-07*
POPR → GDPR	*3.599***	*2.305*	*0.021*
GDPR → POPR	*4.022****	*3.029*	*0.002*
GCE → INQ	*4.152****	*3.250*	*0.001*
INQ → GCE	*3.551***	*2.223*	*0.026*
FDI → INQ	*2.570*	*0.548*	*0.583*
INQ → FDI	*2.570*	*0.547*	*0.584*
MOR → INQ	*6.169****	*2.122*	*0.000*
INQ → MOR	*2.743*	*0.842*	*0.399*
POPR → INQ	*9.788****	*12.878*	*0.000*
INQ → POPR	*9.382****	*12.185*	*0.000*
FDI → GCE	*4.337****	*3.566*	*0.000*
GCE → FDI	*2.776*	*0.899*	*0.368*
MOR → GCE	*6.906****	*7.955*	*2.E-15*
GCE → MOR	*2.089*	*-0.273*	*0.784*
POPR → GCE	*4.236****	*3.393*	*0.000*
GCE → POPR	*4.317****	*3.533*	*0.000*
MOR → FDI	*7.121****	*8.322*	*0.000*
FDI → MOR	*9.686****	*12.705*	*0.000*
POPR → FDI	*3.415***	*1.990*	*0.046*
FDI → POPR	*5.758****	*5.995*	*2.E-09*
POPR → MOR	*5.445****	*5.458*	*5.E-08*
MOR → POPR	*21.93****	*33.634*	*0.000*

Note: *the notation → for null hypothesis implies that the variables does not Granger cause one another, against its alternative hypothesis that, the variables Granger-cause one another for at least one panelvar (id).*

5. Conclusions and policy implications

This paper investigates growth determinants and how they influence income inequality for a panel of 20 Africa countries. In addition, improving on the study of Odedokun and Round (2014) we investigate the impact of major growth determinants as discussed in work of Li et al (2016) for selected Africa countries. By estimating the panel unit root to evaluate the stationarity of the series, we found that the variables are stationary at level, that is, order I(0). Through Hausman specification test, panel fixed effects model was selected as the most appropriate model for our analysis. From the empirical results, we found a positive significant relationship between growth and inequality.

With regards to growth determinants, estimated coefficient of population growth rate is found positively significant. This actually confirms the role played by population growth on economic growth (see Frank, 1999). On the other hand, coefficient on foreign direct investment was found to be positive and statistically significant. This also revealed the importance of foreign investment inflow as it influences the economic capabilities, and it implies that most the African

countries have now been fully integrated into the global economy, which have enhanced them benefitting from international venture, and it has in one way or another reduce the level of income inequality within the region. The coefficient on government consumption expenditure was found negative and statistically significant which tends to play an adverse role on economic growth. This showcase the situation in most of the African countries, where funds that are meant to aid consumption expenditure pattern in these economies and promote growth is rather doing the opposite and thereby enhancing income inequality gaps.

The neutrality hypothesis found between growth and income inequality is indicative for the African countries. This implies that, the level of income inequality do not influence the level of growth within the sampled African countries. Thus, we infer that, external factors such as corruption, macroeconomic and political instability known with this region have been major factors dampening growth and developmental effort of this region. Finally, the good news from this juxtaposition in terms of benchmark concern is that, the possibilities of a sustained growth for Africa are not gloomy. To be precise, African institutions have developed and improved overtime. There is an improvement in health care and a great deal of trade liberalization. However, there remains a huge gap between Africa and other developing countries. Specifically, government role in enhancing consumption expenditure among its citizenry have not been effective. This is a precise warning for Africa government or policymakers, to put birth control to check and make government consumption expenditure more effective by making sure that, what is budgeted for and belongs to the masses; do not end up in the hands of the few rich. Finally, from the empirical results, Africa seems to be an income inequality-independent economy. Income inequality is not a stimulus for economic growth, thus, reduction or increase in the level of income inequality will not slow down or hinder economic performance of most of the Africa countries and the quest to alleviate poverty through curbing income inequality would be hindered.

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