Macroeconomic determinants of economic growth in Africa

OYEBOWALE, Adeola <http://orcid.org/0000-0002-0555-8519> and ALGARHI, Amr Saber <http://orcid.org/0000-0003-2281-3021>

Macroeconomic Determinants of Economic Growth in Africa

Adeola Y. Oyebowale [a,*], and Amr S. Algarhi [a]
Sheffield Business School, Sheffield Hallam University, Howard Street, S1 1WB, United Kingdom.
* Corresponding Author: Adeola Y. Oyebowale. E-mail: a.oyebowale@shu.ac.uk

Abstract

This paper revisits and offers some empirical evidence on macroeconomic determinants of economic growth among twenty-one (21) African economies. This study employs Pooled Mean Group (PMG) estimator on the panel data. Our pooled long-run coefficients indicate that growth rates in exports, government expenditure and gross capital formation have statistically significant positive long-run relationship on economic growth at 1%, 5% and 1% levels respectively; while broad money is not statistically significant among the countries. However, diverse short-run coefficients and error variances differ across the African countries- Congo Republic and South Africa show the most favourable results. We further employ Dumitrescu-Hurlin Granger causality test. Our homogeneous causality evidence shows bidirectional causality between growth in gross capital formation and economic growth among the African countries; while growth in broad money, growth in exports and growth in government expenditure show no direction of causality with economic growth. Nonetheless, heterogeneous causality evidence differs across the countries- Lesotho, Algeria, Cameroon and Benin show the most favourable causality results from the macroeconomic variables to economic growth.

Key words: economic growth, Africa, monetary policy, fiscal policy, exports

JEL classification: E52, E62, F43

1. Introduction

Over decades, the determinants of economic growth have attracted both theoretical and empirical attention among scholars. However, there is a lack of consensus on the topic which provides a germane basis for continuous research and increasing scholarly attention. On the theoretical perspective, early theories of economic growth commenced with mercantilism in the 15th and 17th centuries, which was later replaced by physiocracy during the second half of 18th century. Afterwards, the classical growth theories emerge with Adam Smith (1776), David Ricardo (1821), Karl Marx (1872) and Thomas Malthus (1925). Followed by innovative growth theory of Schumpeter (1911; 1926; 1934); Keynesian and post-Keynesian growth theories commence with the seminal work of Keynes (1936) and later extended in the studies of Harrod (1939) and Domar (1946). Based on the Harrod-Domar growth model, the neo-classical growth theories emanated in the studies of Solow (1956) and Swan (1956) as exogenous growth theory. Additionally, the contribution of Romer (1986) and Lucas (1988) gave birth to new or endogenous neo-classical growth theory by building on the study of Arrow (1962).

With emergence of these aforementioned theories, the factors which boost or hinder economic growth has been an unresolved topic to date, particularly in emerging and developing countries. According to Diao and McMillan (2018), the sources and sustainability of economic growth in Africa has further generated recent heated debate. For instance, the view of Lipton (2012) asserts that mining and commodity prices are a fundamental boom of growth in Africa. Additionally, Rodrick (2016) accentuates that poor industrialization prospects in Africa has created great concern for future growth prospects.

Figure 1 shows that the real GDP growth in Africa experienced a peak of 4.7% in 2010-2014 and reduced to 3.5% and 2.1% in 2015 and 2016 respectively. The reduction in real GDP is partly caused by drastic drop in oil prices and other erupted regional shocks such as drought in South and Eastern Africa (AFDB, 2019). Following a moderate real GDP growth of 2.1% in 2016, economic growth in Africa recovered with 3.6% in 2017 and 3.6% in 2018 (AFDB, 2019). Additionally, AFDB (2019) projects increase in Africa's real GDP growth to 4% and 4.1% in 2019 and 2020 respectively, lower than India and China but higher than other developing and emerging economies. Despite the recovery of Africa's growth from 2016 low growth rate, projected medium-term growth in 2019 and 2020 remains insufficient to combat poverty and unemployment in Africa (AFDB, 2019).

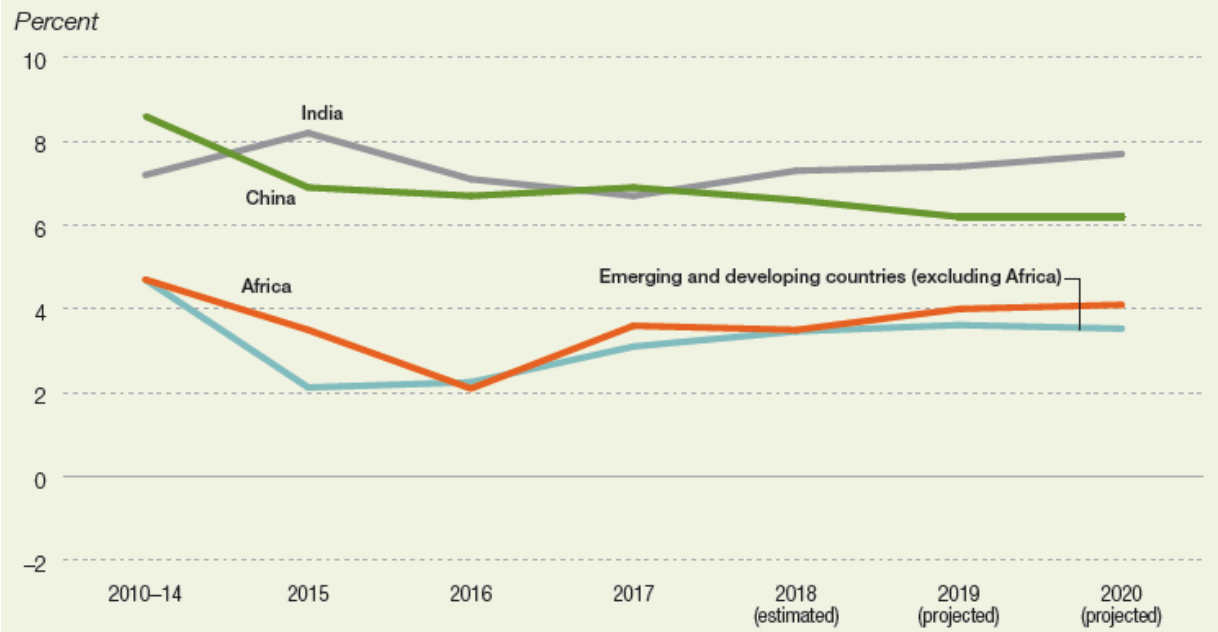

Figure 1: Real GDP Growth in Africa, 2010-20.
Source: African Development Bank Group (AFDB, 2019)

According to International Labour Organisation (ILO, 2019), unemployment of youth in Africa is expected to exceed 30 percent in 2019 and unemployment of young people will be about 3.5 times higher than adults.

Table 1: Unemployment and Poverty Rates in Africa, 2017-2020

Year	Unemployment rate		Extreme working poverty rate		Moderate working poverty rate	
	%	Millions	%	Millions	%	Millions
2017	6.9	32.3	33.6	145.3	22.6	97.8
2018	6.8	33.0	33.0	147.2	22.5	100.3
2019	6.8	34.0	32.5	149.0	22.4	102.8
2020	6.8	34.9	31.9	150.6	22.3	105.3

Source: Authors' compilation from International Labour Organization (ILO, 2019)

Table 1 demonstrates the problem of extensive working poverty in Africa, where 33% and 22% of workers live in extreme and moderate poverty respectively during 2018. These account for 247.5 million workers with an expected increase by 4.3 million and 8.4 million in 2019 and 2020 respectively, resulting from rapid population growth and insufficient level of inclusive growth (ILO, 2019). For unemployment, projected economic growth in 2020 as shown in Figure 1 is inadequate to create required jobs for the fast-growing population. Africa's unemployment rate of 33 million in 2018 is expected to increase by 1 million and 1.9 million in 2019 and 2020 respectively. According to ILO (2019), growth in labour productivity in Africa is expected to remain too slow despite rapid population growth. As

such, we argue that the persistent high unemployment and extreme poverty levels in Africa are drivers of slow labour productivity. Additionally, we argue that these macroeconomic problems are caused by poor implementation of productive measures and macroeconomic policies across countries in the continent. Our argument builds on the earlier argument of Diao and McMillan (2018) that recent growth in Africa is not well understood.

On the empirical perspective of determinants of economic growth, the theories of economic growth have generated a basis for studies in different countries. Despite increasing scholary attention on determinants of growth, existing panel data empirical evidence from Africa are limited as reviewed in the literature of Chirwa and Odhiambo (2016). For instance, the study of Most and Vann De Berg (1996) on 11 Sub-Saharan Africa countries show mixed results among the selected countries. The results show that domestic savings seem to have more influence on economic growth among selected countries than foreign aid and foreign direct investment.

Additionally, the study of Chang and Mendy (2012) on a panel of 36 African countries for the period 1980-2009 shows that trade openness and investment have significant positive relationship with economic growth in Africa. However, gross national savings and investment, and foreign aid have negative relationships on economic growth in Africa. The study of Hossain and Mitra (2013) on 33 highly aid-dependent African countries for the period 1974-2009 reveals that trade opennes, domestic investment and government spending have significant positive long-run effects on economic growth. Furthermore, Anyanwu (2014) shows that domestic investment, official development aid, secondary school enrolment, urban population, metal prices and government effectiveness have significant positive effect on Africa's economic growth. In the Sub-Saharan Africa (SSA) region, the research of Ubi-Abai and Ekere (2018) on 47 SSA countries for the period 1996-2016 shows that monetary and fiscal policies are the main drivers of economic growth. Additionally, the study shows that fiscal policy has a stronger influence on economic growth in SSA.

Based on the highlighted empirical literature, we argue that the limited existing literature on determinants of economic growth in Africa have not provided a strong basis to tackle the continuous macroeconomic problems in the continent. It is against this backdrop that this study seeks to contribute to existing panel empirical evidence in Africa.

2. Data and empirical methodology

In the light of limited panel data empirical evidence, and incessant macroeconomic problems of poverty and unemployment in Africa, our parsimonious model focuses on investigating key macroeconomic determinants of economic growth in the continent. We select 21 African countries[1] for the period 1986-2015 based on the availability of data from World Bank. We use growth in real GDP as a proxy for economic growth. As this study focuses on macroeconomic variables, we use growth in broad money and growth in general government final consumption expenditure as proxy for monetary and fiscal policies respectively. Additionally, we use gross capital formation to support relevance of capital as a driver of economic growth in exogenous neo-classical model of Solow-Swan. More so, following the work of Feder (1983) which argues that allocation of resources to higher productivity export sector stimulates economic growth, we consider growth in exports of goods and services as a macroeconomic variable. As such, the empirical model for this study is written as:

$$gdp_{it} = \beta_0 + \beta_1 brm_{it} + \beta_2 exp_{it} + \beta_3 gov_{it} + \beta_4 gcf_{it} + \mu_i + \epsilon_{it} \quad (1)$$

where gdp, brm, exp, gov and gcf are as defined in Table 2, i is number of countries (1, 2,.....N), t is number of years (1,2…..,T), β_0 is the intercept, μ_i is country-specific or fixed effect, ϵ_{it} is the error term which varies over i and t.

Table 2: Variable Definitions and Summary of Descriptive Statistics

[1]The selected 21countries include: Uganda, Sudan, Mauritius, Rwanda, Madagascar, Lesotho, Kenya, Gabon, Egypt, Algeria, Congo Republic, Comoros, Cameroon, Botswana, South Africa, Morocco, Togo, Nigeria, Mali, Burkina Faso and Benin.

Variable	Description	Mean	Std. Dev.	Min.	Max.	
gdp	Growth in Real GDP (%)	3.946	4.567	-50.248	35.224	Overall
			1.299	2.221	6.398	Between
			4.387	-51.502	33.970	Within
brm	Growth in Broad money (%)	15.791	18.235	-29.245	174.428	Overall
			9.072	5.531	40.071	Between
			15.937	-24.725	151.514	Within
exp	Growth in Exports of goods and services (%)	6.120	15.760	-61.063	118.397	Overall
			3.538	1.397	17.466	Between
			15.377	-62.793	119.331	Within
gov	Growth in General Government final consumption expenditure (%)	6.649	31.061	-71.464	565.539	Overall
			5.779	1.610	23.315	Between
			30.544	-83.559	548.873	Within
gcf	Growth in Gross Capital Formation (%)	7.292	19.994	-81.772	155.785	Overall
			3.470	1.388	13.862	Between
			19.704	-86.615	150.943	Within

Source: Authors' compilations and calculations

Table 2 shows the descriptive statistics of the variables under investigation. The table shows overall statistics and decomposition of the variables into a between and within statistics. For overall statistics, table 2 reports the mean, standard deviation, minimum and maximum values for overall dataset. As such, table 2 indicates that growth in gdp in the overall data set varied between -50.24% and 35.22%, with an average of 3.94% and a standard deviation of 4.56%. These statistics imply that economic growth in the overall dataset has been gloomy. Also, average growth in broad money, growth in exports, growth in government expenditure and growth in gross capital formation for the overall dataset are 15.7%, 6.1%, 6.6% and 7.2% respectively. These statistics also imply existence of slow average growth in the overall dataset over the years under investigation. Additionally, overall statistics for brm, exp, gov and gcf varies between -29.24% and 174.42%, -61.06% and 118.39%, -71.46% and 565.53%, -81.77% and 155.78% respectively. Also, table 2 shows standard deviation of 18.23%, 15.76%, 31.06% and 19.99% for brm, exp, gov and gcf respectively.

Furthermore, between statistics shows descriptive statistics between the 21 African countries. As such, gdp, brm, exp, gov and gcf for each African country varied between 2.22% and 6.39%, 5.53% and 40.07%, 1.39% and 17.46%, 1.61% and 23.31%, 1.38% and 13.86% respectively. The standard deviation between the African countries for gdp, brm, exp, gov and gcf are 1.29%, 9.07%, 3.53%, 5.77% and 3.46% respectively. The within output

provides statistics within each African country, as there are 30 observations per African country. In this regard, a standard deviation of 4.38%, 15.93%, 15.37%, 30.54% and 19.70% for gdp, brm, exp, gov and gcf respectively represent average of the standard deviations for the 21 African countries. The within statistics also show minimum and maximum values for each variable.

3. Empirical Results

3.1 Panel Estimation Technique

Under the influence of the seminal contributions of Pesaran, Shin and Smith (1997, 1999), we provide further evidence to solve the problem of estimating parameters in dynamic panel data models with relatively large *T* and *N*. In this regard, the earlier study of Pesaran, Shin and Smith (1997) considers the mean group (MG) estimator which represents mean of the coefficients. As such, the MG estimator allows all parameters, intercepts, short-run coefficients, long-run coefficients and error variances to differ across groups. However, the later study of Pesaran, Shin and Smith (1999) argues that the MG estimator does not take account that specific parameters may be the same across groups. Against this backdrop, Pesaran, Shin and Smith (1999) further considers the pooled mean group (PMG) estimator as an intermediate estimator involving both pooling and averaging. Hence, the PMG estimator allows the intercepts, short-run coefficients and error variances to differ freely across groups, however, the long-run coefficients are constrained to be the same.

Pesaran, Shin and Smith (1999) argues that estimates of the MG estimator will be inefficient in the presence of long-run slope homogeneity, while the PMG estimators are consistent and efficient. As such, Hausman (1978)-type test is useful to determine the difference between MG and PMG, which further examines the influence of heterogeneity on the means of long-run coefficients between the two estimators. In the light of the argument of Pesaran, Shin and Smith (1999), we apply the Hausman-type test to panel data set of this study as shown in table 3.

Table 3: Hausman-type test on PMG and MG estimates

Independent variables	Coefficients		Hausman Test (p-value)
	MG	PMG	
brm	0.0206173	-0.0058862	
exp	0.0479118	0.0654404	0.3306
gov	0.1869683	0.0254741	
gcf	0.1750383	0.1382698	

H_0: Difference in coefficients not systematic.
Source: Authors' computation

From table 3, the Hausman test examines the null hypothesis of 'difference in coefficients not systematic'. The p-value of 0.3306 denotes rejection of null hypothesis which implies that difference in coefficients in the panel is systematic. Hence, the Hausman test provides statistical evidence to show that the PMG estimator is applicable for this study rather than MG. In addition to the long-run slope homogeneity advantage of PMG, Pesaran, Shin and Smith (1999) further accentuate that the PMG estimator is applicable in both cases of stationary and nonstationary regressors. Consequently, this implies that pre-testing of unit root is not required prior to empirical application of PMG. As such, we apply the PMG estimator on our panel data model without pre-testing of unit root.

In order to examine PMG estimator in the panel, we follow the specification of Pesaran, Shin and Smith (1999) for ARDL (*p,q,q….q*) model as:

$$gdp_{it} = \sum_{j=1}^{p} \lambda_{ij}\, gdp_{i,t-j} + \sum_{j=0}^{q} \delta'_{ij}\, x_{i,t-j} + \mu_i + \epsilon_{it} \qquad (2)$$

Where i is the number of countries, t is the number of years, x_{it} (kx1) is the vector of macroeconomic variables for group i; μ_i represents fixed effects; λ_{ij} are scalars which represent the coefficients of the lagged dependent variables; and δ_{ij} are kx1 coefficient vectors. However, with the existence of cointegration in the panel, equation 2 is re-parameterized as below.

$$\Delta gdp_{it} = \emptyset_i gdp_{i,t-1} + \beta_i' X_{it} + \sum_{j=1}^{p-1} \lambda_{ij}^{*}\, \Delta gdp_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij}^{*\prime} \Delta x_{i,t-j} + \mu_i + \epsilon_{it} \qquad (3)$$

Furthermore, stacking the time-series observations for each country, equation 3 can be written as:

$$\Delta gdp_i = \emptyset_i gdp_{i,-1} + X_i\beta_i + \sum_{j=1}^{p-1} \lambda_{ij}^* \Delta gdp_{i,-j} + \sum_{j=0}^{q-1} \Delta x_{i,-j}\, \delta_{ij}^* + \mu_i \iota + \epsilon_{i,} \quad (4)$$

Where $gdp_i = (gdp_{i1},\ldots,gdp_{iT})'$ represents $T \times 1$ vector of the observations on the dependent variables of the i-th group; $x_i = (x_{i1},\ldots,x_{iT})'$ represents a $T \times k$ matrix of observations on the regressors which differ across countries and years; $\iota = (1,\ldots 1)'$ represents a $T \times 1$ vector of 1s, j period lagged values of y_i and x_i are represented by $y_{i,-j}$ and $x_{i,-j}$ respectively; $\Delta y_i = y_i - y_{i,-1}$, $\Delta x_i = x_i - x_{i,-1}$, $\Delta y_{i,-1}$ and $\Delta x_{i,-1}$ are j period lagged values of Δy_i and Δx_i; $\epsilon_i = (\epsilon_{i1},\ldots \epsilon_{iT})'$.

Thus, we conduct PMG estimator on equation 4 in order to obtain pooled long-run coefficients and diverse short-run coefficients among countries in the panel as shown in table 4.

Table 4: PMG Regression Results

	Dependent variable: gdp				
	ECT	brm	exp	gov	gcf
Long-run Coefficients		-0.0058862	0.0654404	0.0254741	0.1382698
		(0.008)	(0.012)***	(0.012)**	(0.011)***
Short-run Coefficients					
Uganda	-0.8947136	-0.0178088	-0.0235517	0.0064286	-0.0361982
	(0.158)***	(0.019)	(0.012)*	(0.016)	(0.031)
Sudan	-0.9796097	0.0600091	-0.0246186	-0.0078386	-0.0838435
	(0.160)***	(0.032)*	(0.024)	(0.046)	(0.023)***
Mauritius	-0.9965776	0.0256724	0.0672463	0.1019589	-0.0434206
	(0.146)***	(0.043)	(0.032)**	(0.066)	(0.019)**
Rwanda	-0.4529087	-0.1726939	0.0344781	0.0579405	0.2283576
	(0.204)**	(0.098)*	(0.049)	(0.046)	(0.057)***
Madagascar	-0.9895509	0.0010143	0.0232729	0.0137757	-0.0152672
	(0.184)***	(0.028)	(0.026)	(0.023)	(0.024)
Lesotho	-0.4103098	-0.0049811	0.0181982	-0.0188083	-0.013322
	(0.157)***	(0.039)	(0.015)	(0.015)	(0.021)
Kenya	-0.6952803	0.0208496	0.0034791	-0.0264646	-0.0379946
	(0.144)***	(0.050)	(0.030)	(0.054)	(0.026)
Gabon	-0.6619152	0.0363096	0.2026761	0.1079641	0.0297882
	(0.216)***	(0.041)	(0.085)**	(0.050)**	(0.040)
Egypt	-0.4895935	0.1023403	0.0146038	0.2910283	0.0244804
	(0.117)***	(0.029)***	(0.016)	(0.097)***	(0.018)
Algeria	-0.6011035	0.0204126	0.2321026	-0.0556189	0.0174407

	(0.142)***	(0.016)	(0.057)***	(0.035)	(0.031)
Congo Republic	-0.3515917	0.0270998	0.1960426	-0.0128078	-0.0586799
	(0.169)**	(0.023)	(0.064)***	(0.005)**	(0.023)**
Comoros	-0.7969779	-0.0081498	0.1586092	0.1762644	0.0348364
	(0.216)***	(0.026)	(0.084)*	(0.076)**	(0.064)
Cameroon	-0.3114327	-0.0266235	0.1683828	0.1174518	0.0512468
	(0.124)**	(0.029)	(0.037)***	(0.043)***	(0.036)
Botswana	-0.0993486	0.0162637	0.2726796	-0.0131176	0.0431044
	(0.168)	(0.017)	(0.039)***	(0.022)	(0.018)**
South Africa	-0.4310479	0.0769149	0.1082836	0.2444816	0.0093177
	(0.109)***	(0.024)***	(0.024)***	(0.051)***	(0.020)
Morocco	-0.655988	0.0501637	-0.0032336	-0.0196755	-0.0400393
	(0.128)***	(0.099)	(0.055)	(0.064)	(0.060)
Togo	-0.6777745	0.1367239	-0.0081424	-0.0746159	-0.0125075
	(0.208)***	(0.053)**	(0.026)	(0.039)**	(0.029)
Nigeria	-0.6275798	-0.0110909	-0.0348028	-0.0055152	-0.0103028
	(0.233)***	(0.041)	(0.020)*	(0.006)	(0.029)
Mali	-0.9866117	0.103244	0.0389924	0.0070271	-0.0350061
	(0.185)***	(0.041)**	(0.053)	(0.034)	(0.025)
Burkina Faso	-0.9236284	0.0114999	-0.0961509	0.0056042	-0.056177
	(0.140)***	(0.021)	(0.022)***	(0.044)	(0.030)*
Benin	-0.7198668	-0.0049723	-0.0198566	0.0142172	-0.0031461
	(0.142)***	(0.014)	(0.020)	(0.024)	(0.018)

Notes: ***, ** and * denote the level of significance at 1%, 5% and 10%. Standard errors in parenthesis
Source: Author's Computation.

From table 4, the PMG results show heterogeneous in short-run dynamics and common long-run coefficients for the countries in the panel. As such, the results show that exp, gov and gcf have significant positive relationship with economic growth for the selected African countries in the long-run. The long-run significant positive relationship between government spending and economic growth in Africa is consistent with the earlier study of Hossain and Mitra (2013). However, brm prove to have an insignificant relationship with economic growth. The short-run error correction term (speed of adjustment) is significantly negative for all countries. This implies that the relationship between the macroeconomic variables and economic growth is characterised by high predictability with a mean-reverting spread movement.

The short-run coefficients show mixed results across the countries. Most importantly, this study does not find significant relationship among the macroeconomic variables and economic growth in Madagascar, Lesotho, Kenya, Benin and Morocco. On the other hand, Congo Republic and South Africa both show significant relationship between three macroeconomic variables and economic growth. For Congo Republic, exp shows a

significant positive relationship on economic growth, while gov and gcf show significant negative relationship on economic growth. For South Africa, brm, exp and gov show significant positive relationship on economic growth. Be that as it may, this study proceeds to conduct panel Granger causality tests for the model under investigation.

3.2 Panel Granger Causality Test

At the last stage of this paper, we consider Granger causality test for the panel data under investigation. The Pooled Mean Group estimates determine existence of relationship between identified macroeconomic variables and economic growth among the selected African countries. Nonetheless, this method does not indicate direction of causality between the variables. In the light of this, a panel Granger causality test is conducted to examine causal relationships between the variables using Dumitrescu-Hurlin Granger causality test, henceforth DH. The DH test was proposed in the study of Dumitrescu and Hurlin (2012) as an extension to the seminal study of Granger (1969). According to Dumitrescu and Hurlin (2012), two stationary variables *x* and *y* observed for *N* individuals on *T* periods, with i = 1,…,*N* and *t* = 1,…,*T* , the linear model is written as:

$$y_{i,t} = \alpha_i + \sum_{k=1}^{K} \gamma_{ik}\, y_{i,t-k} + \sum_{k=1}^{K} \beta_{ik}\, x_{i,t-k} + \varepsilon_{i,t} \qquad (5)$$

In the underlying regression expressed in (5), coefficients are allowed to vary across individuals but are assumed to be time-variant. Additionally, the panel must be balanced, and the lag order *K* is assumed to be identical for all individuals.

The study of Dumitrescu and Hurlin (2012) defines four kinds of causal relationships based on homogeneous and heterogeneous processes. The first is Homogeneous Non-Causality (HNC) hypothesis, which denotes that no individual causality relationship from *x* to *y* exists. The second is Homogeneous Causality (HC) hypothesis, a symmetric case which denotes that *N* causal relationships exist, and dynamics of *y* is identical for all individuals in the sample. The third is Heterogeneous Causality (HEC) hypothesis, which denotes existence of *N* causality and dynamics of *y* is heterogeneous for all individuals in the sample. The last is Heterogeneous Non-Causality (HENC) hypothesis, which implies existence of causal relationship from *x* to *y* for a subgroup of individuals.

In the earlier section of this paper, relationship between the variables for countries in the panel has been examined using PMG as indicated by the Hausman test. As such, long-run

coefficients are identical while short-run coefficients and error variances differ among individuals or groups. In line with this reasoning, this paper provides a link between PMG and the causal hypotheses of Dumitrescu and Hurlin (2012). Hence, this paper considers Homogeneous Causality (HC) hypothesis and Heterogeneous Causality (HEC) hypothesis suitable to examine causal relationships after PMG estimates.

In a similar vein to the work of Granger (1969), the method to establish existence of causality is to examine significant effects of past values of *x* on the present value of *y*. Hence, the null hypothesis is expressed as:

$$H_0 : \beta_{i1} = \cdots = \beta_{iK} = 0 \qquad \forall i = 1, \dots, N \tag{6}$$

The null hypothesis in (6) corresponds to non-existence of causality for all individuals in the panel. However, the DH test assumes possibility of causality for some individuals but not essentially all. Hence, the alternate hypothesis is expressed as

$$\begin{aligned} H_1 : \beta_{i1} = \cdots = \beta_{iK} = 0 \qquad & \forall i = 1, \dots, N_1 \\ \beta_{i1} \neq 0 \; or \; \dots . \; or \; \beta_{iK} \neq 0 \qquad & \forall i = N_1 + 1, \dots, N \end{aligned} \tag{7}$$

Where N_1 is unknown but should satisfy the condition $0 \leq N_1 / N < 1$. As such, the proposition of Dumitrescu and Hurlin (2012) follows that when $N_1 = N$ there is no existence of causality for any individuals in the panel. On the contrary, when $N_1 = 0$, there is existence of causality for all individuals in the panel. However, Dumitrescu and Hurlin (2012) further notes that the regression model in consideration may not be homogeneous. In this case, $N_1 > 0$, which implies that causal relationships may vary among individuals in the panel. Against this backdrop, the study of Dumitrescu and Hurlin (2012) proposes using average of individual Wald statistics associated with null Homogeneous Non-Causality (HNC) hypothesis defined as:

$$\bar{W} = \frac{1}{N} \sum_{i=1}^{N} W_{i,T} \tag{8}$$

Where $W_{i,T}$ is standard adjusted Wald Statistic for individual i observed during T periods. Based on the assumption that Wald Statistics (W_i) are independent and identical across individuals in the panel, the standardized statistic $\bar{Z}$ when $T \to \infty$ and $N \to \infty$ or Large T and N follows a standard distribution expressed as:

$$\bar{Z} = \sqrt{\frac{N}{2K}} \times (\bar{W} - K) \xrightarrow[T,N \to \infty]{d} N(0,1) \quad (9)$$

Additionally, when $T > 5 + 3K$ which indicates a fixed T dimension or large N in relation to small T datasets, the standardized statistic $\tilde{Z}$ follows a standard nominal distribution as:

$$\tilde{Z} = \sqrt{\frac{N}{2K} \times \frac{T-3K-5}{T-2K-3}} \times \left[\frac{T-3K-3}{T-3K-1} \times \bar{W} - K\right] \xrightarrow[N \to \infty]{d} N(0,1) \quad (10)$$

3.2.1 Homogeneous Causality Test

Table 5 shows Homogeneous Causality (HC) hypothesis using DH test between the macroeconomic variables and economic growth among selected twenty-two (21) countries in the panel. As the dynamics of economic growth is identical for countries in the panel, the DH test shows Granger causality based on the hull hypothesis of no causality between the variables. Based on the assumptions of equations 9 and 10, this study reasonably considers $\bar{Z}$ rather than $\tilde{Z}$ as the panel dataset comprises of large *N* and large *T*. The results presented in table 7 indicate that there is no causality in any direction between growth in broad money, growth in exports, growth in government expenditure and growth in real GDP for all countries in the panel. This is because the p-values are greater than significance levels, as such the null hypothesis of no causality cannot be rejected. However, the results show a bi-directional causality or feedback between growth in gross capital formation and growth in real GDP among countries in the panel.

For broad money and government spending as proxies of monetary and fiscal policies respectively, our empirical results oppose the study of Ubi-Abai and Ekere (2018). As such, we argue that monetary and fiscal policies are not drivers of economic growth in Africa. According to Christensen and Schanz (2018), high debt level in Africa has adverse macroeconomic impact and can undermine the effectiveness of monetary policy. This is because high level of debt may pressurise central banks to keep interest rates lower than expected (Christensen and Schanz, 2018). In this line of reasoning, public debt and ratio of public debt by African governments has doubled since the crash of global oil prices in mid 2014 (Christensen and Schanz, 2018; Devarajan, Gill, & Karakulah, 2019). According to the report of Jubilee Debt Campaign (2018), African government debt payment has increased

from an average of 5.9 percent of government revenue in 2015, to 11.8 percent of government revenue in 2017.

Additionally, the ratio of public debt to GDP has doubled since 2014 with sovereign debt moving from concessional debt provided by official agencies to market-based loans from private institutions (Devarajan, Gill, & Karakulah, 2019). Hence, following the assertion of Christensen and Schanz (2018), we argue that the continuous increase in public debt as a fiscal policy action has concurrently undermined effectiveness of monetary policy in Africa. Despite increase in public debt, there is still recoccuring problems of unemployment and poverty in Africa which generates the question: *'what do African governments do with public debts?'.* As such, we further argue that relentless problems of corruption, misallocation and mismanagement of public funds have flawed productive use of public debt in Africa.

For exports, our findings are consistent with Morrissey and Mold (2006), Freund and Rocha (2010) and Verter (2017). The research of Morrissey and Mold (2006) reveals that the poor performance of exports in Africa over recent decades results from low commodity prices. Thus, the value terms of exports in Africa have failed to drive broader economic growth. In line with this, the study of Freund and Rocha (2010) reveals that transit delays have economical effect on exports in Africa. In addition to this, Verter (2017) asserts that in Africa where primary and intermediate merchandise form significant share of exports, the continent has been struggling to be relevant in the world trade market. As such, advanced and industrialised economies have greater proportion in the world trade due to access to finance and market; possession of better know-how, technology and manufacturing industries (Verter, 2017).

Furthermore, Fruman (2017) asserts that the need for diversification can boost exports and economic growth. For instance, Chile as an example of diversified economy exports over 2,800 distinct products, while larger oil exporting African countries such as Nigeria and Kazakhstan have failed to significantly diversify their range of products to boost exports (Fruman, 2017). Thus, our empirical results provide further evidence to argue that performance of exports in Africa is poor and has failed to enhance economic growth in Africa.

Table 5: DH Panel Granger Causality Test (Homogeneous Causality)

	Independent variables									
	gdp		brm		exp		gov		gcf	
	$\bar{Z}$	$\tilde{Z}$	$\bar{Z}$	$\tilde{Z}$	$\bar{Z}$	$\tilde{Z}$	$\bar{Z}$	$\tilde{Z}$	$\bar{Z}$	$\tilde{Z}$
Dependent variables										
gdp			0.9398 (0.3473)	0.5745 (0.5657)	0.5332 (0.5939)	0.2224 (0.8240)	-0.1182 (0.9059)	-0.3417 (0.7326)	2.1804 (0.0292)**	1.6487 (0.0992)*
brm	1.4324 (0.1520)	1.0011 (0.3168)	No causality in any direction between gdp and brm							
exp	1.6115 (0.1071)	1.1561 (0.2477)			No causality in any direction between gdp and exp					
gov	0.1626 (0.8708)	-0.0985 (0.9215)					No causality in any direction between gdp and gov			
gcf	1.8486 (0.0645)*	1.3614 (0.1734)							Bi-directional causality or feedback between gdp and gcf	

Notes: H_0: Independent variable does not granger-cause dependent variable. $\bar{W}$ values not enclosed, corresponding P-values in parenthesis. ***, ** and * denote the level of significance at 1%, 5% and 10%.P-value > sig level = outcome does not reject the null hypothesis, meaning no causality.

Source: Authors' Computation

In line with the ongoing, we further argue that poor performance of exports in Africa is partly due to several bottlenecks experienced by entrepreneurs and business owners in conducting business activities. As such, we support our argument with the most recent ease of doing business index for the 21 selected countries as shown in table 6. According to the index, which ranks from 1 to 190 (1 as most business-friendly regulations), most African countries have significant high values depicting harsh business regulations except Mauritius with the lowest in table 9 and among other African countries not selected for this study. Hence, in this study, we associate poor performance of exports with high ease of doing business values which implies regulations are not business-friendly in Africa. In the 2019 world ranking, New Zealand, Singapore, Hong Kong, Denmark and Korea Republic have values of 1 to 5 respectively.

Table 6: Ease of Doing Business Index, 2019

	Country	2019 Value
1	Uganda	116
2	Sudan	171
3	Mauritius	13
4	Rwanda	38
5	Madagascar	161
6	Lesotho	122
7	Kenya	56
8	Gabon	169
9	Egypt	114
10	Algeria	157
11	Congo Republic	180
12	Comoros	160
13	Cameroon	167
14	Botswana	87
15	South Africa	84
16	Morocco	53
17	Togo	97
18	Nigeria	131
19	Mali	148
20	Burkina Faso	151
21	Benin	149

Source: Authors' Compilation from World Bank Database

3.2.2 Heterogeneous Causality Test

Additionally, table 7 shows the Wald Test (Wi) and corresponding p-value (PVi) for individual country in the panel under the assumptions of Heterogeneous Causality (HEC) hypothesis. The results show a unidirectional causality running from growth in broad money to growth in real GDP for Mauritius, Cameroon and Benin. In contrast, a unidirectional causality running from growth in real GDP to growth in broad money exists only in Comoros. However, a bidirectional causality or feedback between growth in real GDP and growth in broad money exists only in Rwanda. For the other countries in the panel, this study finds no evidence of causality between growth in real GDP and growth in broad money.

Table 7 also shows a unidirectional causality running from growth in exports to growth in real GDP for Gabon, Burkina Faso and Benin. On the contrary, a unidirectional causality running from growth in real GDP to growth in exports exists in Uganda, Mauritius, Rwanda and Nigeria. For the other countries in the panel, this study finds no evidence of causality between growth in real GDP and growth in exports. Also, this study does not find evidence of bidirectional causality or feedback between growth in real GDP and growth in exports for countries in the panel.

Furthermore, table 7 shows that a unidirectional causality running from growth in government spending to growth in real GDP exists in Lesotho and Algeria. On the other hand, a unidirectional causality running from growth in real GDP to growth in government spending exists in Cameroon and Togo. For the other countries in the panel, this study finds no evidence of causality between growth in real GDP and growth in government spending. Also, this study does not find evidence of bidirectional causality or feedback between growth in real GDP and growth in government spending for countries in the panel.

Lastly, table 7 shows existence of a unidirectional causality running from growth in gross capital formation to growth in real GDP in Sudan, Lesotho, Algeria and Cameroon. Conversely, a unidirectional causality running from growth in real GDP to growth in gross capital formation exists in Uganda, Rwanda and Nigeria. For the other countries in the panel, this study finds no evidence of causality between growth in real GDP and growth in gross capital formation. In a similar vein to growth in exports and growth in government spending, this study does not find evidence of bidirectional causality or feedback between growth in real GDP and growth in gross capital formation for countries in the panel.

Table 7: DH Panel Granger Causality Test (Heterogeneous Causality)

	Direction of causality							
Country	brm to gdp Wi (PVi)	gdp to brm Wi (PVi)	exp to gdp Wi (PVi)	gdp to exp Wi (PVi)	gov to gdp Wi (PVi)	gdp to gov Wi (PVi)	gcf to gdp Wi (PVi)	gdp to gcf Wi (PVi)
Uganda	0.03094021	0.57288719	0.16925102	3.1603319	0.32375628	2.1557771	2.5312027	5.444529
	(0.8617)	(0.4559)	(0.6841)	(0.0871)*	(0.5742)	(0.1540)	(0.1237)	(0.0276)**
Sudan	0.06732633	1.1370343	0.58425287	1.4662241	0.3554347	0.65487398	6.9023589	0.13589313
	(0.7973)	(0.2960)	(0.4515)	(0.2368)	(0.5562)	(0.4257)	(0.0142)**	(0.7153)
Mauritius	3.8220844	1.2297864	0.31739551	5.6830233	0.03639837	0.18784335	1.5995124	1.329032
	(0.0614)*	(0.2776)	(0.5780)	(0.0247)**	(0.8501)	(0.6682)	(0.2171)	(0.2594)
Rwanda	2.9897507	13.989426	1.3504375	3.1401657	0.01024057	2.8411165	0.00024474	4.7267668
	(0.0956)*	(0.0009)***	(0.2557)	(0.0881)*	(0.9201)	(0.1038)	(0.9876)	(0.0389)**
Madagascar	0.07173921	0.09105175	1.780046	0.4139806	0.17742878	0.30036029	0.21833776	0.7697753
	(0.7909)	(0.7652)	(0.1937)	(0.5255)	(0.6770)	(0.5883)	(0.6442)	(0.3883)
Lesotho	0.05108024	0.22577833	0.38112204	1.3606469	3.8039196	0.10148623	3.6172869	0.74914398
	(0.8229)	(0.6386)	(0.5423)	(0.2540)	(0.0619)*	(0.7525)	(0.0683)*	(0.3946)
Kenya	0.27059199	0.23302869	0.4853989	0.01590205	0.06452979	1.9300727	2.6066699	0.21031701
	(0.6073)	(0.6333)	(0.4921)	(0.9006)	(0.8014)	(0.1765)	(0.1184)	(0.6503)
Gabon	0.69988227	0.02693156	3.2475163	0.96021748	0.69380167	0.29117447	0.54248391	1.2807531
	(0.4104)	(0.8709)	(0.0831)*	(0.3361)	(0.4124)	(0.5940)	(0.4679)	(0.2680)
Egypt	1.2888426	2.6828569	0.4690502	0.29245843	0.35883378	0.12602615	0.4910979	0.17441468
	(0.2666)	(0.1134)	(0.4994)	(0.5932)	(0.5543)	(0.7254)	(0.4896)	(0.6796)
Algeria	1.1446404	0.00007183	2.3298901	0.20705642	3.5366674	0.01114946	10.646605	0.06926245
	(0.2945)	(0.9933)	(0.1389)	(0.6528)	(0.0712)*	(0.9167)	(0.0030)***	(0.7944)
Congo Republic	1.9583649	0.05271807	1.3081661	0.52321194	0.19260712	0.35733899	0.07605441	1.7279792
	(0.1735)	(0.8201)	(0.2613)	(0.4759)	(0.6643)	(0.5551)	(0.7848)	(0.2001)
Comoros	1.471751	6.8379942	0.16067377	1.2318127	0.0413045	0.09777506	0.24473303	0.3729174
	(0.2359)	(0.0146)**	(0.6918)	(0.2772)	(0.8405)	(0.7570)	(0.6249)	(0.5467)
Cameroon	4.8101764	0.20425058	0.00302501	0.7842201	0.70592093	4.3749254	3.1842185	2.7015368
	(0.0374)**	(0.6550)	(0.9565)	(0.3839)	(0.4084)	(0.0463)**	(0.0860)*	(0.1122)

(Continued)

Table 7: DH Panel Granger Causality Test (Heterogeneous Causality)

	Direction of Causality							
Country	brm to gdp Wi (PVi)	gdp to brm Wi (PVi)	exp to gdp Wi (PVi)	gdp to exp Wi (PVi)	gov to gdp Wi (PVi)	gdp to gov Wi (PVi)	gcf to gdp Wi (PVi)	gdp to gcf Wi (PVi)
Botswana	1.1914776	0.30174262	0.23314513	2.3643456	0.09280083	0.269651	0.07753058	7.64903
	(0.2850)	(0.5874)	(0.6332)	(0.1362)	(0.7630)	(0.6079)	(0.7828)	(0.0103)
South Africa	1.4585313	1.4956762	0.10687987	0.38795067	0.48790381	1.6589428	0.03609923	1.7653076
	(0.2380)	(0.2323)	(0.7463)	(0.5388)	(0.4910)	(0.2090)	(0.8507)	(0.1955)
Morocco	0.54284463	0.110963	0.99613746	1.9005503	0.37101343	0.1409542	0.12341479	0.09431573
	(0.4678)	(0.7417)	(0.3274)	(0.1797)	(0.5477)	(0.7103)	(0.7281)	(0.7612)
Togo	0.40350275	0.79283286	1.7035406	0.81191797	0.5160194	4.1460023	0.08155056	0.40638964
	(0.5308)	(0.3814)	(0.2032)	(0.3758)	(0.4789)	(0.0520)**	(0.7774)	(0.5293)
Nigeria	0.90528977	0.96290561	0.09052943	4.6948867	5.824e-06	0.46563537	2.016e-06	4.0451693
	(0.3501)	(0.3354)	(0.7658)	(0.0395)**	(0.9980)	(0.5010)	(0.9988)	(0.0547)**
Mali	0.00240636	0.08357054	0.15836983	0.2082801	2.8546973	0.31561011	0.00312383	0.10811294
	(0.9612)	(0.7748)	(0.6939)	(0.6519)	(0.1030)	(0.5790)	(0.9558)	(0.7449)
Burkina Faso	0.11603179	0.10445926	4.4265424	0.07119587	1.1207874	0.73949065	1.8702698	0.00193977
	(0.7361)	(0.7491)	(0.0452)**	(0.7917)	(0.2994)	(0.3976)	(0.1831)	(0.9652)
Benin	4.9342394	0.28221668	5.0771872	2.8025247	2.6170076	1.596873	1.6071788	0.39123817
	(0.0352)**	(0.5997)	(0.0329)**	(0.1061)	(0.1177)	(0.2175)	(0.2161)	(0.5371)

Notes: H_0: Independent variable does not granger-cause dependent variable. $\bar{W}$ values not enclosed, corresponding P-values in parenthesis. ***, ** and * denote the level of significance at 1%, 5% and 10%. P-value > sig level = outcome does not reject the null hypothesis, meaning no causality.

Source: Authors' Computation

From the individual Granger causality results in table 7, the causal factors of economic growth in the selected African countries are summarised in table 8 below.

Table 8: Summary of Granger Causality Tests

	Country	Direction of causality	
		Macroeconomic variables to gdp	Gdp to macroeconomic variables
1	Uganda	-	exp, gcf
2	Sudan	gcf	-
3	Mauritius	brm	exp
4	Rwanda	brm	brm, exp, gcf
5	Madagascar	-	-
6	Lesotho	gov, gcf	-
7	Kenya	-	-
8	Gabon	exp	-
9	Egypt	-	-
10	Algeria	gov, gcf	-
11	Congo Republic	-	-
12	Comoros	-	brm
13	Cameroon	brm, gcf	gov
14	Botswana	-	-
15	South Africa	-	-
16	Morocco	-	-
17	Togo	-	gov
18	Nigeria	-	exp, gcf
19	Mali	-	-
20	Burkina Faso	exp	-
21	Benin	brm, exp	-

Source: Authors' Computation

4. Conclusion and discussion

One of our arguments in this paper is that the persistent high unemployment and extreme poverty levels in Africa are attributable to poor implementation of productive measures and macroeconomic policies across countries in the continent. In the light of this, our study contributes to the studies of Most and Vann De Berg (1996), Chang and Mendy (2012), Hossain and Mitra (2013) and Anyanwu (2014) by examining the key macroeconomic determinants of economic growth in selected 21 African countries for the period 1986 to 2015. Our empirical estimation shows that exports, government expenditure and gross capital formation have significant positive long-run relationship on economic growth among the

selected African countries. However, broad money is not statistically significant. Additionally, our results show mixed short-run relationship between macroeconomic variables and economic growth among the selected African countries. For causality, our results show bidirectional causality between gross capital formation and economic growth among the selected African countries, while other macroeconomic variables show no causality on economic growth. By and large, our results depict that monetary and fiscal policy measures, and exports are not effective drivers of economic growth in the Africa. Thus, our empirical results support our argument that productive macroeconomic measures and policies in Africa are poorly implemented.

Based on our empirical findings, we propose that the incessant problems of unemployment and poverty in Africa can be reduced through adoption of various productive measures and macroeconomic policies. For instance, trade integration dimension of regional economic integrations in Africa can be improved through the intervention of African Union (AU) and World Trade Organisation (WTO). Similar to advanced and industrialised economies, AU and WTO should implement measures to ensure business organisations especially SMEs (Small and Medium Scale Enterprises) operating in African countries have access to finance and market. This can be achieved through different schemes to encourage loans with the aim of boosting production and business activities. Additionally, AU and WTO should ensure African countries possess better know-how, technology and manufacturing industries to enhance production activities.

Furthermore, following the assertion of Fruman (2017), AU and WTO should encourage significant diversification of products among African countries to boost exports. Thus, African countries should reduce over dependence on some products and diversify to other range of products they can produce and export, especially top oil producing countries in Africa. Also, business regulators in different African countries should adopt measures to reduce existing bottlenecks facing entrepreneurs and business owners which have created harsh business environment for exports. More so, agencies saddled with the responsibility of fighting against corrupt practices among public officials in Africa should ensure measures are introduced to reduce corruption, misallocation and mismanagement of public funds. Consequently, this would ensure public debts are utilised productively to enhance fiscal policy in boosting aggregate economic output.

Following these policy recommendations which can strengthen production for exports, it becomes somewhat safe to recommend reduction of public debt by African governments. As such, reduction in public debt can further help to enhance effectiveness of monetary policy in Africa. Consequently, central banks in Africa should enjoy instrument independence in order to implement expansionary monetary policy through increase in money supply (Oyebowale and Karley, 2018) and lending to boost spending, investment and economic growth.

Acknowledgements

The authors are solely responsible for comments, suggestions and views in this paper.

Funding

The authors received no financial support for the research, authorship and/or publication of this article.

ORCID

Adeola Oyebowale https://orcid.org/0000-0002-0555-8519

References

African Development Bank Group. 2019. *African Economic Outlook* . Retrieved from https://www.afdb.org/en/documents/african-economic-outlook-aeo-2019-english-version

Anyanwu, J. 2014. Factors Affecting Economic Growth in Africa: Are there any Lessons from China? *African Development Review , 26* (3), 484-493.

Arrow, K. 1962. The Economic Implications of Learning by Doing. *The Review of Economic Studies , 29* (3), 155-173.

Chang, C. and Mendy, M. 2012. Economic Growth and Openness in Africa: What is the Empirical Relationship? *Applied Economics Letters , 19* (18), 1903-1907.

Chirwa, T. G. and Odhiambo, N. 2016. Macroeconomic Determinants of Economic Growth: A Review of International Literature. *South East European Journal of Economics and Business , 11* (2), 33-47.

Christensen, B. and Schanz, J. 2018. *Central banks and debt: emerging risks to the effectiveness of monetary policy in Africa?* Bank for International Settlements.

Devarajan, S., Gill, I. and Karakulah, K. 2019. *Debt, Growth and Stability in Africa: Speculative Calculations and Policy Responses.* Speculative Paper.

Diao, X. and McMillan, M. 2018. Toward an Understanding of Economic Growth in Africa: A Reinterpretation of the Lewis Model. *World Development , 109*, 511-522.

Domar, E. 1946. Capital Expansion, Rate of Growth and Employment. *Econometrica , 14* (2), 137-147.

Dumitrescu, E. and Hurlin, C. 2012. Testing for Granger Non-causality in Heterogenous Panels. *Economic Modelling , 29* (4), 1450-1460.

Feder, G. 1983. On Export and Economic Growth . *Journal of Development Economics , 12* (1), 59-73.

Fruman, C. 2017. *Economic diversification: A priority for action, now more than ever.* Retrieved from https://blogs.worldbank.org/psd/economic-diversification-priority-action-now-more-ever

Granger, C. 1969. Investigating Causal Relations by Econometric Models and Cross-spectral Methods. *Econometrica , 37* (3), 424-438.

Harrod, R. 1939. An Essay in Dynamic Theory. *The Economic Journal , 49* (193), 14-33.

Hausman, J. 1978. Specification Tests in Econometrics. *Econometrica , 46* (6), 1251-1271.

Hossain, S. and Mitra, R. 2013. The Determinants of Economic Growth in Africa: A Dynamic Causality and Panel Cointegration Analysis. *Economic Analysis and Policy , 43* (2), 217-226.

ILO. 2019. *World Employment Social Outlook: Trends 2019.* Geneva: International Labour Office.

Jubilee Debt Campaign. 2018. *Africa's growing debt crisis: Who is the debt owed to?* Retrieved from https://jubileedebt.org.uk/wp/wp-content/uploads/2018/09/Briefing_09.18.pdf

Keynes, J. 1936. *The General Theory of Employment, Interest and Money.* London: Macmillan.

Lipton, M. 2012. *Income from work: The Food-Population-Resource Crisis in the 'Short Africa'.* Sussex University: Leontief Prize Lecture, Tufts University, Medford, MA. 3 April.

Lucas, R. 1988. On the Mechanisms of Economic Development. *Journal of Monetary Economics , 22* (1), 3-42.

Morrissey, O. and Mold, A. 2006. Explaining Africa's Export Performance – Taking a New Look.*http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.482.8532&rep=rep1&type=pdf* .

Most, S. and Vann De Berg, H. 1996. Growth in Africa: Does the Source of Investment Financing Matter? *Applied Economics , 28* (11), 1427-1433.

Neal, T. 2014. Panel cointegration analysis with xtpedroni. *The Stata Journal , 14* (3), 684-692.

Oyebowale, A.Y. and Karley, N. K. 2018. Investigating Finance-Growth Nexus: Further Evidence from Nigeria. *International Journal of Economics and Finance , 10* (9), 121-135.

Pedroni, P. 1999. Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics , 61*, 653-670.

Pedroni, P. 2004. Panel Cointegration: Asymptotic and finite sample properties of pooled time series with an application to the PPP hypothesis. *Econometric Theory , 20*, 597-625.

Pesaran, M., Shin, Y. and Smith, R. 1997. *Pooled Estimation of Long-run Relationships in Dynamic Heterogeneous Panels.* Cambridge: University of Cambridge.

Pesaran, M., Shin, Y. and Smith, R. 1999. Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. *Journal of the American Statistical Association , 94* (446), 621-634.

Rodrick, D. 2016. An African Growth Miracle. *Journal of African Economies , 27* (1), 10-27.

Romer, P. 1986. Increasing Returns and Long-Run Growth. *Journal of Political Economy , 94* (5), 1002-1037.

Schumpeter, J. 1911. *The Theory of Economic Development.* Cambridge, MA: Harvard University Press.

Schumpeter, J. 1926. *Theorie der wirtschaftlichen Entwicklung: Eine Untersuchung uber Unternehmergewinn, Kapital, Kredit, Zins und den Konjunkturzyklus* ((2nd revd edn). Munchen and Leipzig: Duncker & Humblot Verlag. ed.).

Schumpeter, J. 1934. *Theory of economic development.* Cambridge, MA: Harvard University Press.

Solow, R. 1956. A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics , 70* (1), 65-94.

Swan, T. 1956. Economic Growth and Capital Accumulation. *Economic Record , 32* (2), 334-361.

Ubi-Abai, I., and Ekere, D. 2018. Fiscal Policy, Monetary Policy and Economic Growth in Sub-Saharan Africa. *https://mpra.ub.uni-muenchen.de/91950/1/MPRA_paper_91950.pdf* .