Effects of Income Inequality on Population Growth in Africa

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Abstract

Africa remains the most youthful continent globally with a median age of 19.4 years compared to 29.6 globally, with the population expected to account for 39.12 per cent of the world's population by 2100, against 16.14 per cent in 2015 (Odusola *et al.*, 2017). Thus, this study will examine the effects of income inequality on population growth in ten (10) selected Africa countries. Data from the Standardized World Income Inequality Data (SWIID) of Soltz (2016), World Development Indicators (WDI) of World Bank and World Governance Indicators/International Country Risk Guide (WGI/ICRG) will be used for the study. Dynamic Panel Model estimation using the Generalized Method of Mean (GMM) estimators suggested by (Arellano and Bond, 1991) will be used for the analysis. The study is expected to provide more facts on population growth in Africa, harnessing population growth to create equity and relationship between fertility rate and Gini-coefficient in Africa
Keywords: ***Income inequality, Population Growth and Economic Development***

1.0.Introduction

One important issue for development is the extent to which determinants of economic growth play in different countries (Poshakwale and Ganguly, 2015); meanwhile economic growth is essential to maintain and improving international competiveness of a country (Auzina-Emsina, 2014 and Demeter *et al*., 2011). High institutional quality has been argued as an economic growth momentum by incentivizing economic activities such as consumption and investment (Zhang, 2016), improving efficiency (Dal Bó and Rossi 2007), allocating resources more efficiently (Park, 2012 and Lucifora and Moriconi, 2015), protecting property rights and supporting freedom of choice (Farhadi, 2015). According to 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. Growth is important because it helps one to take a further look into the future. According to Simon *et al.* (2010), common perception has long been an inverse on Africa's 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. 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 difficulty

the world is facing. Dabla-Norris *et al*., (2015) refers to it as the defining challenge of our time, they argue critically against the economy of exclusion. In Africa, 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 African nations stay vulnerable to economic, social and political turbulence (Akadiri and Akadiri, 2018). Apart from consumption and wealth inequalities, Africa is known for disproportionate access to education and health and nutrition, access to and use of public services, labour-market inequalities, and the ability to influence decision making on public matters (Okojie and Shimeles, 2006). What is particularly striking about all these forms of inequality is that they have significant ethnic, gender, and spatial dimensions, while racial dimensions also play a role in some parts of Southern Africa. Often, these dimensions overlap. As far as ethnicity is concerned, it is well known that Africa is extremely diverse and that ethnic favouritism plays a large distributional role and that it is a significant factor explaining underdevelopment (Frank and Rainer 2012; Bates, 1983; Londregan *et al.,* 1995). Also, the issue of whether economic growth improves or exacerbates the income distribution has been subjected to debate since the pioneering work of Kuznets in 1955 (Kuznets, 1955). He introduced the idea of an inverted U-shaped relationship between economic development and income inequality, and based his proposition on the premise that, as an economy develops its structure of production shifts from agricultural to industrial (Kuznets, 1955). However, agricultural and rural sector forms the bulk of the economy of sub-Saharan African countries and are characterized by low per capita income and low inequality. As the economy develops and people shift from the agricultural to the industrial sector, those who move recorded a rise in their incomes, thereby raising the level of inequality in the economy. Therefore, at early stages of development, there is a positive relationship between economic growth and inequality. As more workers shift from the agricultural sector to the industrial sector, the reduced supply in the agricultural sector drives up wages in this sector (Liyanage and Lee, 2013). Also, those who move to the industrial sector work harder and move up the ladder to attain the income of the richer workers. Hence, inequality falls with later stages of development, resulting in a negative relationship between economic growth and inequality (Kuznets, 1955 and Barro, 2000). Therefore, based on Kuznets' (Kuznets, 1955) theory, it is possible to note an inverted U-shaped relationship between economic growth and income inequality.

1.1.Problem Statement

Considering inequality in Africa, using the Gini coefficient (Gini net and Gini market) as the measure of within-country income inequality, it has been widely established that some of the most unequal economies in the world are in Africa. The average Gini coefficient in Africa is 0.43, compared to the rest of the developing world, at 0.39 (Naidoo and Bhorat, 2017). This shows the prevalence of extreme inequality in Africa which is not in the same trend as with other developing economies of the world. Also, using the Standardized World Inequality Indicator Data (SWIID) Gini coefficients and the World Bank (2014b) for growth data, there is a weak relationship between rate of economic growth and change in the Gini coefficient for a large number of African economies (World Bank, 2014). The proportion of the population living below the extreme poverty line is similar among the African countries on average, at 39.0-46.0

per cent of the population. This is significantly higher than the poverty rates in the other developing regions of South Asia and Latin America and the Caribbean (LAC) (Naidoo and Bhorat, 2017). For example, the proportion of people living in extreme poverty in Central Africa is 2.5 times that of South Asia and 4.6 times that of LAC. Clearly, there are marked variations in poverty levels across the different countries. Four of the most populous countries in Africa Nigeria, Ethiopia, Democratic Republic of the Congo and United Republic of Tanzania are home to almost half of Africa's poor, which inextricably links Africa's progress in reducing poverty to the performance of these countries (World Bank, 2014 Povcal Net data).

Also, despite the remarkable macroeconomic performance of Africa over the last decade, the continent has fallen behind in its goal of poverty reduction. While extreme poverty has fallen since 1990, almost 50.0 per cent of Africa's population about 413 million people continue to live below the extreme poverty line (World Bank, 2014b). Though, poverty is now falling in Africa, but not as rapidly as in South and East Asia. This has resulted in Africa's share of global poverty increasing from 22.0 per cent in 1990 to 33.0 per cent in 2010 (Africa Progress Panel, 2014). The increase in poverty is an indication of rapidly growing population in Africa without any corresponding balance in income inequality. Hence, this study will examine the effects of governance and institutional quality on growth inequality in 15 developing Africa countries with the following specific objectives;

- profiles the causes of income inequalities in Africa;
- identify factors affecting income inequalities in African countries;
- establish the relationship between income inequality and population growth in Africa;
- profiles key factors contributing to overpopulation in Africa.

2.0. Literature Review

In a cross-sectional analysis of all developing countries, Chauvet and Collier (2004) found that countries suffering from poor governance, on average, experience 2.3 percentage points less GDP growth per year relative to other developing countries. In order to overcome this effect of using cross-sectional data, Thornton, (2001) found out that inequality inclined to rise at lower levels of income, and subsequently fall with higher income levels while Chambers (2010) observed that in the long run growth is accompanied by a decline in inequality in developing countries and rising inequality in developed countries. These findings were in line with Kuznets hypothesis, and the hypothesis can only be applied to developing countries (Jha, 1996). Also, Anyanwu *et al*., (2015) discovered that higher levels of past income inequality are positively associated with current levels of income inequality in Africa. They also find an evidence of existence of the Kuznets curve in the sub-region, which proposed that inequality may rise with the initial increase in per capita income but will decline afterwards and the higher population growth appears to be income equalizing in West Africa. Therefore, to analyse the relationship population growth and income inequality in Africa, this proposal will investigate linkages and pathways based on the theories underpinning the relationships among the variables. However, to avoid the endogeneity trap, we will employ a dynamic panel model (GMM) to establish and correct for this problem in order to have robust and unbiased estimates. In the foreground of this information, conclusions will be drawn regarding whether income inequalities in Africa are a determinants or contributing factors to high population growth.

Finally, this proposed study is of relevance, as it will contribute on-going literatures the relationship among population growth and income inequality in Africa. It will assist in the understanding of how governance and institutional quality tackles growth inequality in Africa. The study can thus serve as a basis for the formulation of efficient policies that will enhance good governance and institutional quality towards tackling population growth and income inequality in Africa.

3.0. Methodology and Data

Theoretical Framework

3.1. Fixed (FE) and Random (RE) Effects Models

The unobserved heterogeneity of the developing countries may lead to country-specific unobserved characteristics that could correlate with the explanatory variables in the model. One of the possible options for handling the unobserved heterogeneity is to use Fixed Effects (FE) to control for the unobserved effects. So, the second method of the regression equation assumes constant but not homogenous country specific effects, which leads to Fixed Effects (FE) model. "Fixed Effects (FE) model is the best fit if we assume that the unobserved heterogeneity among the countries only results in parametric shifts of the regression function and that it is correlated with one or more of the explanatory variables (Wooldridge, 2002)".

In case of Random Effect model, we assume non-constant country specific effects and the time effects are absent. Here, we can control for the unobservable heterogeneity through a general least-square estimation (GLS) process if it is assumed that the error terms of each individual country are randomly distributed across countries and hence the unobserved effects are uncorrelated with any explanatory variables.

3.2. The Generalized Method of Moments (GMM) estimation

In econometric analysis, panel data has several advantages over the conventional cross-sectional or time-series data. Since panel data involves a larger number of data points, it offers more degrees of freedom and reduces collinearity among the independent variables. Hence, it can improve the efficiency of econometric estimates (Hsiao, 2003). However, the use of panel data in this study can introduce the problem of heteroscedasticity and autocorrelation into the model. Owing to heterogeneity in the characteristics of different countries involve, it is likely that the error-variance will not be constant across observations. Also, the explanatory variables are possibly endogenous and, including the lagged dependent variable may lead to correlation between this variable and the first-differenced error (Lee and Azali, 2010). Hence, the lagged dependent variables will be correlated with the error term, resulting in biased and inconsistent estimators if the OLS estimation method is used.

3.2.Panel unit Root Tests

Variables to be used would not be possible or the parameters will be weak if the series are random walks or have a near unit root processes. Hence, the use of the first-differenced GMM estimator can therefore; lead to large finite-sample downward biases (Blundel and Bond, 1998).

The standard orthogonally conditions under the first-differenced GMM estimator do not hold when the levels series contain unit root (Lee and Azali, 2010). Hence, it is essential that unit root tests are first performed on the series.

This study will employ the commonly used Panel unit Root test proposed by Levin, Lin and Chu (Levin *et al.*,2002), also known as LLC, which tests the null hypothesis of non-stationarity or the presence of unit root. Augmented Dickey Fuller (ADF) test will be performed on the data set in order to check for stationarity of the series. The LLC considers the following ADF specification:

$$\Delta \boldsymbol{y_{it}} = \boldsymbol{\alpha_i} + \boldsymbol{y_i y_{i,t-1}} + \sum_{\boldsymbol{j=1}}^{\boldsymbol{k}} \boldsymbol{\alpha_j} \Delta \boldsymbol{y_{i,t-f}} + \boldsymbol{e_{i,t}} \qquad \textbf{(1)}$$

Where *y* is the variable to be tested, *t = 1,*

T refers to the time periods, and *i = 1… N* denotes the members of the panel (Levin *et al.,* 2002). The lag lengths, *k,* will be chosen based on three different information criteria; Schwarz, Akaike and Hannan-Quinn. The γ_i is restricted to be the same across the cross- sections. The null hypothesis for the LLC test will be stated as $\gamma_i = \gamma = 0$ for all *i,* denoting non-stationarity in the panel data. The alternative hypothesis can be stated as $\gamma_1 = \gamma_2 \ldots = \gamma < 0$ for all *i,* indicating that the panel data are stationary.

3.4. System GMM

If the panel unit root tests show evidence of non-stationarity in the levels series, then the first-differenced GMM estimation method cannot be used. Blundell and Bond proposed the system GMM estimator that uses additional moment restrictions to improve the downward bias caused by near unit root processes (Blundel and Bond, 1998). The system GMM estimator exploits "reasonable stationary restrictions on the initial condition processes" which reduces the bias considerably (Lee and Azali, 2010). This estimator estimates a set of first-differenced equations that use suitably lagged levels as instruments, as well as levels equations with suitably lagged first-differences as instruments. The system GMM estimator combines the two sets of moment conditions as a linear GMM estimator in a system that contains both first-differenced and level equations (Lee and Azali, 2010). If unit roots are detected in the series, then following Blundell and Bond's (Blundell and Bond, 1998) framework, this study will use both the levels and the differences of growth, institutional quality, and lagged poverty and income inequality measures as instrumental variables.

3.5. Specification Tests

Sargan Test

The Sargan test of over-identifying restrictions analyzes the sample analog of the moment conditions used in order to test the overall validity of the instruments. This test is very useful in ascertaining whether the instruments chosen are independent of the error term. Failure to reject the null hypothesis indicates that the instruments are not correlated with the error term and, therefore, instrumental variable estimates based on the selected instruments are valid (Chong and Gradstein, 2000; Gujarati, 2003)

Serial Autocorrelation

This test examines whether the differenced error term is first- or second-order serially correlated. In general, the presence of first-order serial correlation is quite likely, even in cases where the error term in levels is uncorrelated, "unless the latter follows a random walk. The failure to reject the null hypothesis of no second-order serial correlation suggests that the error term in levels (the original error term) is serially uncorrelated and that the GMM estimator would be consistent (Chong and Gradstein, 2000)

4.0. Data Source and Description

Data for fifteen (15) selected developing countries in Africa (Nigeria, Cote d'Ivoire, Ghana, Senegal, Kenya, Angola, Rwanda, Uganda, Botswana and Ethiopia) will be analyzed in this study. Data on income inequality, (Gini net and Gini market) will be source from the Standardized World Income Inequality Data (SWIID) of the Solt's (2016) while Real Gross Domestic Product, Total population, Age dependency ratio from the World Development Indicators WDI 2017). Regulatory quality, Rule of law, Political Stability, Government effectiveness and Economic Freedom index data will be source from World Governance Indicators/International Country Risk Guide (WGI/ICRG). Further explanation on these indicators is provided in Table 1(see appendix)

4.1. Econometric Model Specification

This study proposes data from 15 Africa countries for a period of 1996-2016. The equation will be estimated using the Arellano-Bover/Blundell-Bond system GMM estimator. Though the standard estimation methods use in analyzing Panel data are fixed effects or random effects, but neither of these methods can be used in this study because of equations of lagged endogenous variable in our model (Governance institutional and inequality measure). Hence, the study will employ (Generalized Method of Mean) GMM estimators suggested by Arellano and Bond (Arellona and Bond, 1991). This overcomes the problems that could arise in dynamic panel data models. The dynamic panel approach improves on previous efforts to examine the effect of governance and institutions on growth inequality in the following ways:

- Panel estimation allows exploitation of the time-series and cross-sectional nature of the dynamic relationships between governance, institutional quality and growth inequality;
- In instrumental variable regressions involving purely cross-country data, the error term includes any unobserved country-specific effects, which may result in biased coefficient estimates; and
- The GMM estimator helps to control for possible endogeneity of all the independent variables. This dynamic panel estimator does not require the error term to take any particular distributions. Thus, GMM estimators produce efficient and consistent estimates even in the presence of heteroscedasticity (Salman, 2013; Liyanage and Lee, 2013)

The problem of endogeneity can be resolved by using GMM as used in (Liyanage and Lee, 2013), Have economic Growth, Institutional quality contributed to poverty and inequality reduction in Asia? Arellano and Bond (1991) GMM estimator is usually called standard first-differenced GMM estimator. Also, the augmented version of GMM is proposed by Arellano and Bover (1995) and Blundell and Bond (1998), which is known as system GMM estimator.

To specify the dynamic GMM model, equation (1) can be rewritten as follows-

$$Y_{it} = \rho Y_{it-1} + \beta X_{it} + n_i + \varepsilon_{it} \qquad (2)$$

Where,

Y_{it} =Log of Gross Domestic Product Growth GDP growth (Measure of growth inequality):

$Y_{it} - Y_{it-1}$= represents the set of control variables that affect (GDP) growth, measure of growth inequality other than lagged growth Inequality, this includes income inequality measures, institutional quality and governance variables.

η_i=Unobserved country-specific effects

δ_t=Time specific, country invariant effect

X_{it}=The vector of the explanatory variables

ρ, β = Coefficients of parameters to be estimated

ε_{it} = The time-varying error term

Subscript (i) = countries (i=1, 2… N) (t) =time (t=1, 2 …T)

To eliminate unobserved heterogeneity Arellano and Bond, (1991) suggest first-differencing Equation (2). By first differencing equation (2) can be written as -

$$\left(Y_{it} - Y_{i,t-1}\right) = \rho\left(Y_{i,t-1} - Y_{i,t-2}\right) + \beta\left(X_{it} - X_{i,t-1}\right) + \Delta\varepsilon_{it} \qquad (3)$$

The equation can be rewritten as

$$\Delta Y_{it} = \rho \Delta Y_{it-1} + \beta \Delta X_{it} + \Delta\varepsilon_{it} \qquad (4)$$

The equation (2) is known as difference GMM. By differencing the equation, difference GMM eliminates the unobserved country-specific effect since the disturbance η_i does not vary with time. Thus eliminating omitted variable bias. Moreover, difference GMM helps overcome endogeneity by using lagged-values of the explanatory variables as instruments. However, first-differencing generates a new statistical issue that the constructed differenced error term ($\Delta\varepsilon^{it}$) is now correlated with the differenced lagged variable. As a solution, Arellano and Bover (1995), Blundell and Bond (1998) proposed system GMM. The Arellano and Bover (1995) and Blundell and Bond (1998) estimator augments Arellano-Bond (1991). It builds a system of two equations: one is the original equation in levels and the other is the transformed one in differences. This is known as system GMM. This allows the introduction of more instruments and can improve efficiency. Instruments for the differenced equation are obtained from the lagged levels of the explanatory variables, while instruments for the level equation are the lagged differences of explanatory variables. The consistency or specification test (Sargan test and Serial autocorrelation test) of the GMM estimator depends on the validity of the moment conditions which has been described above

5.0. Expected Outcomes

This study is expected to provide insights into the following:

- the causes of income inequalities in Africa;
- factors affecting income inequalities in African countries;
- the relationship between income inequality and population growth in Africa and
- factors contributing to overpopulation in Africa.

About me

Idowu James FASAKIN is a researcher and a PhD Candidate at the Department of Agricultural Economics, University of Ibadan. His PhD thesis is "*Resilience to shock and Livelihood Diversification of Female Headed Households in Nigeria*. He is currently a 2019 CARE Grant winner with International Institute of Tropical Agriculture and International Fund for Agricultural Development (IITA/IFAD), where he is conducting research on rice Contract Farming (CF) in Nigeria. He was formerly an Agricultural Economist Adviser (volunteer) with Cuso International, Canada, where he provided technical advisers to Agricultural Field officers working with rural Framers in Guyana. Also, he was formerly a Monitoring and Evaluation Officer (*Aquaculture Value Chain*) on a USAID/MARKETS II project between July 2014 and June 2017 where he supervised, collated data and monitored successful training of over 6000 registered Fish farmers and thousands of non-registered/non-mobilized fish farmers on improved aquaculture practices in Nigeria. He is an author, an astute data analyst and has experience of working with people in rural areas with developmental challenges, and has some publications to his credit.

Table (i): List of Variables, Description and Sources

Variable	Description	Source(s)
Gross Domestic Product (GDP)	Real Gross Domestic Product, (USD)	World Development Indicators(WDI)/FAOSTAT
Gini net	Gini post-tax and transfer	(SWIID) Solt's (2016)
Gini market	Gini pre-tax and transfer	(SWIID) Solt's (2016)
Regulatory Quality	Ability of the government to provide sound policies and regulations that enable and promote private sector development	World Governance Indicators (WGI)
Rule of Law	Extent to which agents have confidence in and abide by the rules of society, including the quality of property rights, the police, and the courts, as well as the risk of crime	World Governance Indicators (WGI)
Government Effectiveness	The quality of public services, the capacity of the civil service and its independence from political pressures, and the quality of policy formulation	World Governance Indicators (WGI)
Political Stability	Likelihood of the government will be destabilized by unconstitutional or violent means, including terrorism	World Governance Indicators (WGI)
Population Growth	Log of percentage of population growth	WDI/FAOSTAT

Human Capital index	Log of Secondary school enrollment (percentage of gross) is used as a proxy for human capital.	WDI/FAOSTAT
Transparency, accountability and voice indicators	Measure by Freedom of expression, association and press	World Governance Indicators (WGI)

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