Analysis of Economic Growth and Kuznets Hypothesis: Testing for Evidence from Sub-Saharan Africa

Joseph Antwi Baafi
Department of Economics, Kwame Nkrumah University of Science & Technology, Kumasi. Ghana

Abstract
As SSA countries strive towards growth, certain challenges are inevitable. Minimizing these challenges could go a long way to speed up the process of growth. One of those challenges is income inequality. The theory that addresses such challenge during the process of growth is the Kuznets hypothesis. This work set out to find out whether or not the Kuznets hypothesis hold for SSA countries using autoregressive distributed lag model. The study used a country-by-county regression method on 37 SSA countries. The variables used included - life expectancy, human capital, unemployment, good market, capital market and net bilateral aid. Out of 37 countries used in the study, 24 of these countries supported the Kuznets hypothesis. Real GDP per capita was positive and significant for most countries and few countries have negative coefficient. The result from both countries reveals that the coefficient of human capital was negative even though that of Kenya was not significant. Life expectancy variable was negative and significant for countries that were integrated of order 0 or 1. The coefficient for unemployment was positive for all countries. For some countries, the good market coefficient was negative whiles others were positive. The same could be said for the coefficient of the capital market. Countries with negative capital market coefficient also have negative net bilateral aid coefficient. The short run dynamics also showed that, on average the coefficient of the error correction term for SSA countries was equal to 0.51. This means any deviation from short run income inequality is corrected by 51 percent over each year in long span of time. The study recommends that governments should pay close attention to capital market. Attention should be given to the human capital. Human capital formation through education and skills should be given the necessary consideration.
Keywords: Kuznets Hypothesis, Sub-Sahara Africa, Economic Growth

1. Introduction

The issue of income inequality has been a global concern in recent past. Internationally, the poorest 20 percent of people receive just 1.5 percent of the world's income. An estimated 1,374 billion people live on less than $1.25 per day at 2005 U.S purchasing power parity, and some 2.6 billion – close to 40 percent of the world's population – live on less than $2 a day (Todaro and Smith, 2102). Bringing the incomes of those living on less than $1.25 per day up to this minimal poverty line would require less than 2 percent of the incomes of the world's wealthiest 10 percent. Thus the scale of global inequality is enormous. But this gap in per capita incomes between rich and poor countries is not the only sign of the huge global economic disparities. To appreciate the widest deprivation in developing countries, it is also necessary to look at the gap between rich and poor within individual developing countries. Very high levels of inequality – extremes in the relative incomes of higher – and lower-income citizens – are found in many middle-income countries namely Latin America and Africa. Inequality is also mostly high in many resources-rich developing countries in the Middle East as well. Several African countries, including Sierra Leone, Lesotho and South Africa have among the highest level of inequality in the world. Indeed in many of these cases, inequality is substantially higher than in most developed countries. In terms of within country income inequality, SSA is said to have had the widest gap between the rich and poor.

This subject of inequality has been researched by many economists, but the most notable one that has enjoyed wider discussion is the Kuznets hypothesis. The Kuznets hypothesis states that when at first a country starts on the development path progressing from being a relatively poor country to a relatively richer one, increases in income increase income inequality, but, after a certain level of development is reached, further increases in income decrease income inequality. Historically, this idea was rooted in the main notions of economic development of the 1950s. At this time, development and industrialization were used largely as synonyms, and the process of economic development was universally seen as the process which transfers labour from a traditional low productivity, rural sector (agriculture) economy to a "modern", high productivity, urban sector (industry) economy.

As sub-Sahara African countries strives towards growth and development overtime, certain problems that are associated with growth becomes evident. For example there are challenges posed by environmental conditions with its root in land, water and air pollution, human rights issues, equity and equality in social living, social justices, human development, sustainability, freedoms, empowerment as well as commitment to international issues. Paramount among these problems is the issue of income inequality at the intermediate stages of development. What is worrying is that high inequality undermines social stability and solidarity, strengthens the political power of the rich and hence their economic bargaining power (Todaro and Smith, 2013). Such powers are used to encourage outcomes favourable to themselves such as rent seeking, excessive lobbying, large political donations, bribery and cronyism. This problem has been a continual source of conflict in most of sub-Sahara African countries. For example, Collier and Hoeffler (1998) have acknowledged that there is prevalence of civil war where higher income is expected on the opportunity cost of rebellion by those individual who are marginalized. Because the poor suffer from under nutrition and poor health, have little or not literacy, live in environmentally degraded areas, have little political voice and are socially excluded, they become agents through which political violent are easily fuelled. This view is supported by Elbadawi and Sambanis (2000) who asserted that with deepening inequality, young men are more likely to be enlisted in rebellion camp because of higher expected gain. In the work of Buhaug and Ketil (2006) it is also stated that wealth inequality is a major source of political conflict and violence. The implication is that if the increase in income inequality can be a major source of conflict, then sub-Sahara Africa countries seeking growth and development through various means should be fully aware of such risks and insure themselves against such through appropriate policies in their developmental process.

The motivation behind this paper is to determine whether or not income inequalities exist in these countries at their current stage of development which will help us draw practical inference for strategic policy considerations. If the hypothesis is true, then major policies about equity should be given a major consideration. This is crucial because Kuznets hypothesis has been widely tested in other part of the world and has proven to be of good tool in the policies of some of these economies. But the same cannot be said of economies in SSA. The aim of the work is to test whether or not the Kuznets hypothesis holds for economies in SSA as they strive towards growth and development in the future. The year of duration will be from 1960 to 2012.

Researchers have used three major methodologies to undertake this test. These include cross-country regressions, panel regressions, country-by-country regressions/case studies. The cross-country regression considers a relationship across countries observed at a given moment in time. The panel regression considers a relationship across countries over a given period of time and the country by country regression considers the relationship across time in one country or in a group of countries taking each separately. This paper adopted the country-by-country regression methodology using Autoregressive Distributed Lag modeling (ARDL). The use of time series autoregressive distributed lag modeling (ARDL) has emerged as a new methodology in recent literatures. One major importance of using this methodology according to the literature is that it helps in making out the short and long run effects influencing a relationship.

The rest of the paper is organized as follows: the next section presents the literature review in theoretical and applied empirical forms followed by the methodology of the study. Section four contains empirical results and section five is devoted to conclusions and recommendation.

2. Literature Review

2.1. Theoretical Perspective

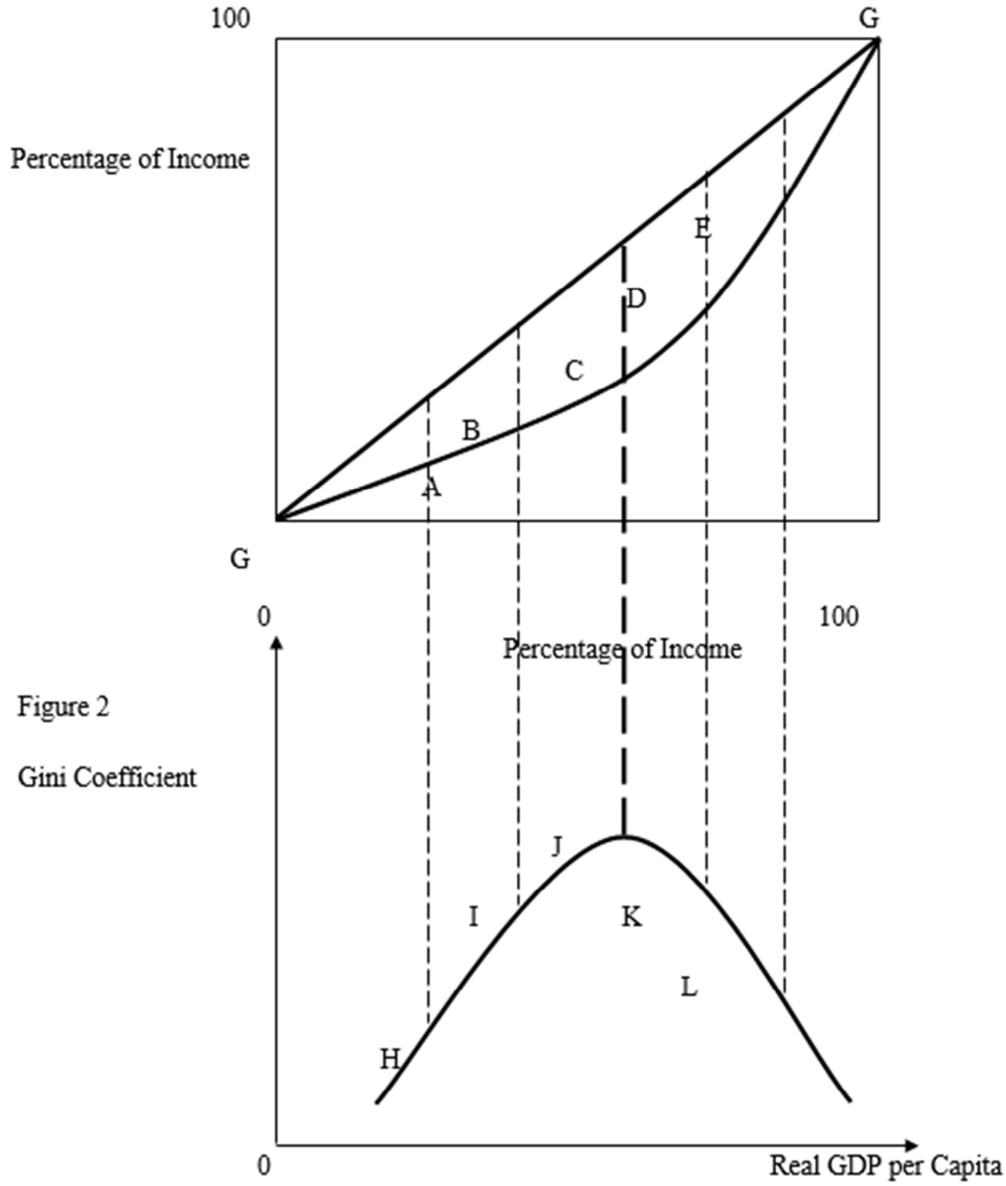
Among the theories of economic growth, the one that gives a clear explanation to the process of structural transformation is the Lewis theory of growth. The main idea behind the model is the process of labour transfer from traditional to modern sector and the growth of output and employment in the modern sector. Lewis divided the sectors of an underdeveloped economy into two: a traditional overpopulated rural subsistence sector and a high productive modern industrial sector. The traditional sector was characterized with zero marginal productivity and surplus labour because labour could be transferred from this sector without any loss of output. As investment increases in the modern industrialized sector as a result of capital accumulation, labour will be enticed to move from the traditional sector to the industrialized sector. It is this premise that Simon Kuznets (1966) formed the theory concerning inequality.

The theory states that at low levels of income, income inequality is also low. This is because all individuals live at or close to subsistence level. Larger indifference in income seldom occurs. But over time when economic growth begins to happen, income inequality also begins to increase. The growth process will ensure that economic activities move from the traditional sector where incomes are low to modern industrial sector where incomes are high. At this stage of industrialization, wage differentiation also becomes greater. The theory explains that income distribution reveals a non-monotonic movement throughout the entire process of economic growth. In other words, it does not show consistently increasing and never decreasing or consistently decreasing and never increasing in value. Income distribution broadens during the economy's transition from agriculture to an industrial system, it stabilizes for sometimes and contrast as more mature stages are achieved. Kuznets hypothesis of explaining income inequality is known as the Kuznets inverted U curve.

Fields (1980) used Lorenz curve to analyze three limiting cases of dualistic development. These are the modern-sector enlargement growth topology, the modern-sector enrichment growth topology and the traditional-sector enrichment growth topology. Using these special cases and Lorenz curves, Fields demonstrated the validity of the following propositions. In the traditional-sector enrichment typology, growth results in higher income, an equal relative distribution of income and less poverty. Traditional-sector enrichment growth causes the Lorenz curve to shift uniformly upward and closer toward the line of equality. In the modern-sector enrichment growth typology, growth results in higher incomes, a less equal relative distribution of income, and no change in poverty. This causes the Lorenz curve of shift downward and farther from the line of equality. With the modern-sector enlargement growth, absolute income rise and absolute poverty is reduced, but the Lorenz curves will always cross, indicating that we cannot make any unambiguous statement about changes in relative inequality. It may improve or worsen.

We can connect the Lorenz curve and the inverted U curve to have a better understanding of the relationship between income inequality and income. These are shown in figure 1 and 2 respectively. Line G-G on the Lorenz curve shows perfect equality in income distribution. Any curve to the right gives the level of inequality. Therefore, curved line G-A-B-C-D-E-G is the inequality line. The area between G-G and G-A-B-C-D-E-G shows the level of inequality in an economy. Points A-B-C-D-E on the Lorenz curve corresponds to points H-I-J-K-L on the Kuznets curve. At the initial stages of growth, income inequality begins to widen from point G to B and A. This point is shown on the Kuznets curve from H to I. At a point, inequality peaks at C corresponding to point J on figure two and begins to falls. There is therefore some kind to linkage between the Lorenz curve and Kuznets hypothesis.

Lorenz Curve



Source: Author's Diagram, (2016)

Figure 1: Connecting Lorenz curve and the inverted U curve

A cursory look at the literatures gives an idea of three major categories of theories that have tried to offer explanation to the invested U curve. The first group of explanation is based on the existence of a dual economy. These groups of economists follow Fields' dualistic development already identified in previous chapters. The second group is based on imperfections in the capital market, the role played by investment in human capital and demographic transition. The third group is based on social choices because of various political system or effects of institutional constraint.

Researchers that fall within the second group may include Greenwood and Jovanovic (1990). These authors offered explanation where economic growth was linked with development of financial markets and institutions. But linkage between the two were just one aspect, the other aspect has to do with the improvement of an economy's financial system and the scope to which its services are spread across the population. As the economy grows, financial markets also grows but only a few rich groups of people may be able to fully benefit of the development in the financial markets causing income inequality to rise. As development progress, investment in financial sector increases and the whole population may demand a share of the higher income. This causes income inequality to reduce as development trickles down widely. Rotheli (2010) also agreed with this viewpoint and concluded that with an effective financial market total income increases faster and thus inequality tend to be lower than without an effective financial market.

Galor and Tsiddon (1997*a*) also gave explanation based on accumulation in human capital and the extension of technological knowledge that comes from it. According to this theory, the accumulation of human capital through education takes the leading role in the process of economic growth. The starting is from a poor uneducated population where incomes are low and evenly distributed. Out of this, certain few individuals strives to achieve higher education and as the economy grows as a results of technological knowledge through higher education, the benefits will be enjoyed by these individual with higher education causing wider income inequality. Over time as technological knowledge begin to spread, the gains also begin to spread to everybody and the growing educational status of the individuals within the economy ensures a much even distribution of income. Sarigiannidou (2012), built on this idea and gave explanation based on accumulation in human capital and the expansion of knowledge in the society. This theory looked at the role of financial market in aiding individual access education that leads to further expansion in knowledge.

Other researchers also drifted from the aforementioned traditional explanations to offer a much broader view of the subject focusing on the role played by technological progress. Galor and Tsiddon (1997*a*), Aghion and Howitt (1997), and Helpman (1997) and others fall into such class of researchers. These literatures explain that the existence of two technologies (old and new one) causes individuals living within the economy to choose where they want to be employed. Younger generation would certainly move to sectors of new technologies whilst older generation would remain in sectors of old technologies. The introduction of new technologies signifies rapid economic growth and increased inequality is inevitable especially when higher marginal returns are paid to younger generations that work in new technologies sector because they are able and low returns are paid to older generations working in old sector technology. As development progresses, complex technologies gain easy access to a wider range of individuals thereby evening out on marginal returns causing inequality to reduce over time.

Aside these explanations, some literatures have also aimed at measuring the determinants of income inequalities. That is, what are the general determinants of wider inequality during the early stages of development? The earlier stages of development of this hypothesis considered economic factors as the only determinant. That is, supply and demand of various factors of production. Other factors that fall under economic determinants include the need for efficient capital market and establishing a consistent basic financial infrastructure and regulatory framework that promote such ideals in an economy. The influence of society in promoting income inequality was relegated to the background. Income distribution was only any economic issue. But recent literatures have suggested counter ideas to this view. The role of societal influence has been given prominence. Milannovic (2000) identified two major determinants of income inequality of which societal role played a major part. The two determinants includes level of development measured by income per capita and social (or public policy) choice where the latter reflects societal influence. Other sub-determinants under the public policy include percentage of workers employed in the state sectors and the scope of government transfers measured as a share of GDP. These factors, Milanovic (2000) acknowledged as 'the product of political decision both current and past'. These new emerging ideas have brought about a new hypothesis known as Kuznets 'augmented' hypothesis. This hypothesis states that "once income is 'accounted for', there is still sizeable discretion regarding income inequality. Income distribution is viewed as a product of social choices… the population may have a high preference for redistributing income through transfers … the middle classes may have had experience of downward mobility and may regard transfers as an insurance proposition lest they themselves becomes poor" Milanovic (2000) p.51. The new hypothesis further made a proposition that the larger the size of state sector, the larger the reduction in inequality because of compact wage distribution as compared to the private sector.

The whole idea of income inequality is important for critical assessment for two major reasons: inequality negatively affect growth (Deininger and Squire, 1998), effect of inequality on growth through political channels, as lower earning voters will support higher taxes that could be a disincentive to investment further lowering growth. Other reasons include that fact that income equality can lead to economic distortions (Alesnia and Roderik, 1994 and Tabellini 1994), high tendency for rent seeking, corruption, and rise macroeconomic unpredictability (Stiglitz, 2012), decrease the standard of living of the poor and marginalized, and can create socio-political instability (Alesina and Perroti, 1999). Practically, Kumhof and Ranciere (2010), argued that one of the main cause of the Great Depression in 1930 and Recession in 2007 was unequal income distribution. The authors explained that before is crises, there was increase in income of the Higher income class and the debt-income ratio for the poor and middle class increased. This increased the inequality gap and thus it's attending problems.

2.1 Empirical Perspective

The most notable researcher who found evidence in favour of the Kuznets inverted U shaped hypothesis is Kuznets (1995). Using time series and cross-sectional data for United States, England and Germany and Sri Lanka, India and Puerto Rico, Kuznets found evidence in support of Kuznets hypothesis. Kuznets (1995) used the ratio of the income of richest 20 percent and poorest 60 percent to measure inequality. The result showed that for India, Sri Lanka and Puerto Rica the ratio were higher than the ratio of United States and United Kingdom. Again, Kuznets found that there were inter-sectoral differences in incomes in developing countries because of disparities in income between agricultural and modern sectors. He further found that on a global stage, the share of top 5 percent of population in the higher income bracket after World War II was 20% and in 1920 and 1930 the share increased to 30 percent in most of the countries. Accordingly, the share of the bottom 60 percent of the population was below 30 percent in 1920 and 1930 and increased higher than 30 percent after World War II. A similar study by Oshima (1962) points to the same conclusion.

Paukert (1973) used a total number of 56 countries, made up of 13 developed and 43 developing to investigate the validity of the hypothesis. The dataset was cross sectional with variables been GDP per capita and Gini coefficients. The study found out that Gini index for developing countries was 0.467 and 0.392 for developed ones. This difference in Gini index supported the hypothesis as developing countries exhibit a dual economy described by Kuznets. Ahluwalia (1976a), also sampled a total of 60 countries consisting of 40 developing, 14 developed and 6 socialist and used multivariate regression to estimate cross country relationship in testing the hypothesis. Two different equations were modeled. One equation had all 60 countries controlling for socialist countries and the other equation had 40 developing countries. The results showed a strong support for the hypothesis and further found that population growth rate had negative effects on the income shares of the lower and middle-income group and positive effect on the income share of top 20 percent. Urban development was positively related to lowest income group and inversely related to higher income groups. Ram (1988) sampled 32 countries. These were a mixture of developing and developed countries. Using quadratic regression model, the study found evidence in favour of the hypothesis. Using World Bank data for 76 countries, Jha (1996) also found evidence in favour of the hypothesis. In the study, Jha (1996) used pooled regression framework together with OLS method.

The use of non-parametric and semi-parametric functions came to the forefront because of the problem of misspecification functional form. Among the early adopters of this approach included Ogwang (1994). The study use the data considered by Ram (1988) and applied a non-parametric regression to the data. They study found a strong support for the hypothesis and further concluded that government policies and institutional structures are vital determinants of income distribution. Lin et al (2007) used semi-parametric quantile regression on a cross section of data for 75 countries. The study showed that the hypothesis hold for countries with mild inequality but not for countries with too high or too low inequality. Using non-parametric and semi parametric unbalanced panel data model, Xianbo and Li (2011), study confirmed the Kuznets hypothesis. The work found that the hypothesis is validated when per capita income is $1340. The study also found that policy instruments and economic performance plays an important role in reducing inequality. Desbordes et al (2012) and Lis' (2002) used semi parametric fixed effects regression for 113 countries from 1960 – 2000 and found evidence in favour of the hypothesis. In so doing, the study warned that the misspecification of a functional form in panel model with fixed effects can lead to wrong conclusions in reference to inequality measurement.

Bahmani-Oskoee and Gelan (2008) used autoregressive distributed lag modeling (ARDL) on US data from 1957 to 2002 and found that growth worsens income inequality in the short run and decrease income inequality in the long run. The work further revealed that population has a negative impact both in the short and long run. Using the same methodology Shahbaz (2010), working on dataset of Pakistan from 1971 to 2005 found evidence in support of the hypthosis. When the researcher made use of cubic term for the log of GDP, the study still supported the hypothesis. Again it was revealed that Human Development Index (HDI) and unemployment increase inequality while urbanization reduces it. Working on the Chinese economy between 1978 to 2011 Cheng and Wu (2014) used the same technique and found evidence in support of the hypothesis in terms of Theils index as well as Gini coefficient as a measure of inequality. The study also found urbanization as the major factor in influencing income inequality.

Other authors have also found little or no evidence for the hypothesis. Deininger and Squire (1996, 1998) used panel dataset of a larger number of countries in the world and found a little support for Kuznets hypothesis. The study therefore concluded that the hypothesis may be irrelevant for developing countries. Saith (1983) also found similar results. Garth (2006) used dataset developed by Squire and Deininger (1996) and employing the methodology of overlapping non-parametric regression investigated how income inequality in both within and across countries differs at different levels of growth and development found little evidence in favour of the hypothesis. Luis (2010) used panel data of a set of countries and used employment outside agriculture as an explanatory variable in place of GDP per capita in conducting a test of the hypothesis. The justification of the use of employment outside agriculture stems from Kuznets work with respect to movement of labour supply from agric sector to industrial sector. The study found evidence against Kuznets hypothesis. Motonishi (2006) found limited support and revealed that agricultural, nonagricultural, and household income has an important role in explaining income inequality. Sato et al (2009) worked on the South Korean economy between 1975 and 1995 found no support for the hypothesis. Kim et al (2011) found a similar result for a study on 48 States in the US with the results being robust to difference sensitivity tests.

3.0 Methodology

3.1 Data Collection

Data for this study was obtained from World Development indicator (WDI, 2013) from 1960 to 2012, Penn World Tables version 8.0 and Standardized World Income Inequality Database, Version 3.0. The study used 37 sub-Saharan African countries (see Appendix, table 1 for the list of countries). Variables included in the model are Gini Coefficient, real GDP per capita, unemployment, human capital, life expectancy, net bilateral aid, openness in good market and openness in capital market. Data on Gini Coefficient was from Standardized World Income Inequality Database. Data on net bilaterial aid, openness in good market, openness in capital market and life expectancy was from WDI, 2013 and data on unemployment and human capital was from Penn World Tables. These variables are measured as follows;

GINI is gini index within the countries. This measures the level of inequality. The Gini index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus a Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

Unemployment refers to the share of labor force that is without work but available for and seeking employment. It is measured as number of unemployed individuals as a percentage of the total labour force.

Life Expectancy at birth indicates the average number of years a newborn infant would live. Life expectancy at birth used here is the average number of years a newborn is expected to live if mortality patterns at the time of its birth remain constant in the future. It reflects the overall mortality level of a population, and summarizes the mortality pattern that prevails across all age groups in a given year. It is calculated in a period life table which reflects a snapshot of a mortality pattern of a population at a given time. It therefore does not reflect actual mortality patterns that a person actually goes through during his/her life, which can be calculated in a cohort life table.

Net bilateral aid flows are the net disbursements of official development assistance (ODA) or official aid from the members of the Development Assistance Committee (DAC). Net disbursements are gross disbursements of grants and loans minus repayments of principal on earlier loans. ODA consists of loans made on concessional terms (with a grant element of at least 25 percent, calculated at a rate of discount of 10 percent) and grants made to promote economic development and welfare in countries and territories in the DAC list of ODA recipients. Official aid refers to aid flows from official donors to countries and territories in part II of the DAC list of recipients: more advanced countries of Central and Eastern Europe, the countries of the former Soviet Union, and certain advanced developing countries and territories.

Human Capital is measured by Index of human capital per person. This is based on years of schooling and returns to education.

Good Market Openness is measured by total merchandise trade as a percentage of GDP. This refers to total Merchandise export and import as a share of GDP.

Capital Market Openness is measured by foreign direct investment inflows. These are net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. It is measured by foreign direct investment net inflows as a percentage of GDP.

3.2 Econometric tests

The natural route for a test of Kuznets hypothesis is to search for a relationship between income per capita and inequality. However, this procedure of regressing inequality on income per capita which has dominated various literatures has been challenged by Angeles (2007). Angeles (2007) noted that difference by income is caused by the movement of the economy from agriculture to industry. In other words, income difference is caused by structural transformation. That is the driving mechanism according to Kuznets. Therefore a proper test of the hypothesis should rather look at the relationship between the structure of the economy (being the driving mechanism) and inequality. The proposal is that to test the Kuznets hypothesis one should try to ascertain whether population shifts from agriculture to other sectors are related in any methodological way to income inequality. This however cannot be seen in large empirical works available. Angeles (2007) further explained that income per capita and inequality show evidence of correlation and not causality because both are driven by a common factor that is structural transformation. Therefore regressing one variable on the other would cause an econometric problem known as endogeneity since the regressor (income per capita) is correlated with an omitted variable (structural transformation).

Ever since the theory was developed by Kuznets, various researchers have attempted to test it using one of the following econometric approaches: Cross-country regressions, Panel regressions and Country by country regressions and case studies. The cross-country regressions methodology considers the relationship across different countries at a given time. The Panel regressions methodology also considers the relationship across different countries and across different time. The country by country regressions looks for a relationship across time in an individual country or a group of countries in which each country is considered independently of each other.

Among these three methodologies, the country by country regressions is completely acceptable. The panel regression is reasonable but the cross-country regression is derisory (Angeles, 2007). The reasons for making this statement are due to the problems that are associated with the panel and cross country methodologies.

Due to data restrictions, the first methodology (cross-country methodology) dominated tests of the Kuznets hypothesis until the 1990s. The major drawback of this methodology is the fact that it makes two implicit assumptions that can led to spurious results. The first assumption is that the relationship between per capita income and inequality are the same for all countries used in a particular study. For example if there are group of developed and undeveloped countries, the relationships between the two variables are equal. The second assumption is that other factors that influence inequality are either absent or are the same across countries. On the basis of the fact that the theory was a description on just one country, testing it across a group of countries is to say that, across different developmental stages different countries are images of each other which cannot be wholly true. In an attempt to solve such problems, earlier researchers have introduced dummy variables but even with that, the results are not robust.

Because of these problems, researchers in recent empirical works have made use of panel regression methodology. This technique has an advantage of controlling for all time-invariant country characteristics. This is done through the inclusion of fixed effects. The major disadvantage of this methodology is an implicit assumption that income per capita affects inequality in the same way in all countries. But at least, this methodology has helped solved serious problems that would have hitherto led to spurious results.

Researchers have again tried to solve problem posed by the panel regression methodology by considering each country individually. This is the only approach that is consistent with the Kuznets hypothesis. By using this approach a pattern rise and fall in income inequality throughout the country's developmental process can be easily observed. This technique does not have any inherent regression problem. However, very few works on Kuznets hypothesis has used this methodology because of data demands as compared to the other methodology. Researches' that have mostly used this method are done in developed country and virtually no work has been done on developing countries using this technique. This study applies this technique to 37 developing sub-Saharan African countries.

3.3 Methodological framework

This study uses the advanced Autoregressive Distributed Lag (ARDL) procedure proposed by Pesaran and Shin (2001). This method has two main advantages over others. Firstly, if the variables used in the model are integrated at I(0), I(1) or I(0)/I(1), then it is valid for cointegration. Secondly, this method is dynamic and gives better results for small sample data set. The ARDL is modeled as shown below

$\aleph(L,\chi)y_t = \aleph_o + \sum_{i=1}^{k} \xi_i(L,\chi)x_{it} + \Gamma' m_t + \varepsilon_t$ ……………………………….10

$\forall t = 1, \ldots \ldots \ldots \ldots.., n$

Where

$\aleph(L,\chi) = 1 - \aleph_1 L - \aleph_2 L^2 - \ldots \ldots \ldots - \aleph_\chi L^\chi$

$\xi_i(L,d_i) = \xi_{i0} + \xi_{i1} L + \xi_{12} L^2 + \cdots \ldots \ldots + \xi_{id_i} L^{di} \forall_i = 1, 2 \ldots.., k$

y_t= independent variable, $\aleph_o$= constant term, L = lag operator. The long-term elasticities are estimated by

$$\ell_i = \frac{\hat{\xi}_i(1,\hat{d})}{\aleph(1,\hat{\chi})} = \frac{\hat{\xi}_{io} + \hat{\xi}_{i1} + \cdots + \hat{\xi}_{i\hat{d}}}{1 - \hat{\aleph}_1 - \hat{\aleph}_2 - \cdots - \hat{\aleph}_\chi} \qquad \forall i = 1,2,\dots,k$$

Where $\hat{\chi}$ *and* $\hat{d}_i$, *i = 1,2, ... k* are the selected values of $\hat{\chi}$ *and* $\hat{d}_i$, *i = 1,2, ... k*
The long run coefficients are estimated by

$$\eta = \frac{\hat{\Gamma}(\hat{\chi}, \hat{d}_1, \hat{d}_2, \dots, \hat{d}_k)}{1 - \hat{\aleph}_1 - \hat{\aleph}_2 - \cdots - \hat{\aleph}_\chi}$$

Where
$\hat{\Gamma}(\hat{\chi}, \hat{d}_1, \hat{d}_2, \dots, \hat{d}_k)$ = OLS estimates of $\hat{\Gamma}$ in equation 10. The ECM is therefore derived as follows

$$\Delta y_t = \Delta\aleph_0 - \aleph(1,\hat{\chi})EC_{t-1} + \sum_{i=1}^{k} \xi_{i0}\Delta x_{it} + \Gamma'\Delta m_t - \sum_{j=1}^{\hat{\chi}-1} \aleph_j \Delta y_{t-1} - \sum_{i=1}^{k}\sum_{j=1}^{\hat{d}_{t-1}} \xi_{ij}\Delta x_{i,t-j} + \varepsilon_t$$

Where ECM = error correction model and is given below

$$ECM_t = y_t - \aleph - \sum \hat{\xi}_i x_{it} - \Gamma' m_t$$

Where x_i= variables which are not co-integrated among themselves and ε_t=error term with zero mean and constant variance-covariance.

3.4 Model specification

According to the theory, income inequality is mostly featured at the early stage of economic development but this situation improves at the later stages. Researchers have modeled two equations to consider the linearity and non-linearity between economic growth and income equality:

$lnGINI_t = \varphi_1 lnGDP_t + \vartheta_o + \varepsilon_t$……………………………………………..1

$lnGINI_t = \varphi_2 lnGDP_t + \varphi_3(lnGDP_t)^2 + \vartheta_0 + \epsilon_t$……………………………2

Where GINI = GINI-coefficient which measures income inequality
GDP = GDP per capita which measures economic growth
ϑ_0 = control variables, ε_t and ϵ_t are error terms in equation 1 and 2 respectively

To establish the Kuznets hypothesis, then $\varphi_2 > 0$ *and* $\varphi_3 < 0$ must hold in equation 2. This equation only holds true if the assumption that the error term is normally distributed (zero serial correlation) $(i.i.d \sim (0, \delta^2))$ stand. In case this assumption is violated, the standard error of the estimates becomes biased leading to inefficient results. To solve this problem, the AR(1) procedure is used. Therefore, equation 1 becomes

$lnGINI_t = \varphi_1^* lnGDP_t + \vartheta_0^* + \varepsilon_t$……………………………………………..3

Where $\varepsilon_t = \rho\varepsilon_{t-1} + \xi_t$ and equation 2 also becomes

$lnGINI_t = \varphi_2^* lnGDP_t + \varphi_3^*(lnGDP_t)^2 + \vartheta_0^* + \epsilon_t$……………………………4

Where $\epsilon_t = \rho\epsilon_{t-1} + \xi_t$, ρ = coefficient of correlation between $\epsilon_t - \epsilon_{t-1}$ and ξ_t is the white noise and ϑ_0^* are still the control variables. $\varphi_3^*(lnGDP_t)^2$ in the right hand side of equation 4 indicates the turning point of the curve. The above solution holds if the source of serial correlation is in the residual. However, if it comes from other sources such as an omitted lagged dependent variable, then both the standard errors and coefficient could be biased (Shahbaz, 2010). To deal with this issue, a lagged dependent variable is introduce and thus equation 1 becomes

$lnGINI_t = \psi^* lnGDP_{t-1} + \psi_1^* lnGDP_t + \vartheta_o + \varepsilon_t$……………………………5

An assumption that the lagged dependent variable should not be correlated with the current error term is imposed. If this assumption holds, the results give us unbiased and consistent estimates of the coefficient. Following this, equation 5 thus becomes

$lnGINI_t - lnGINI_{t-1} = \omega^*(lnGINI_{t-1} - lnGINI_{t-2}) + \omega_1^*(lnGDP_t - lnGDP_{t-1}) + \nu_t - \nu_{t-1}$…………………………………………………………………………..6

In equation 6, an assumption of no second order autocorrelation in the first-differenced residuals. Thus the final specification of the linear and non-linear model becomes

$\ln GINI_t = \varpi_o + \varpi_1 lnGDP_t + \varpi_s COV + \epsilon_t$…………………………………7

$\ln GINI_t = \wp_o + \wp_1 lnGDP_t + \wp_2 lnGDP^2 + \wp_s COV + \ell_t$…………………8

To arrive at a S-curve, a cubic term in specification 8 for all countries is introduced. Thus,

$\ln GINI_t = \pi_o + \pi_1 lnGDP_t + \pi_2 lnGDP_t^2 + \pi_3 lnGDP_t^3 + \pi_s COV + \sigma_t$……9

Where GINI and GDP are already defined and COV are control variable, which measures unemployment, human capital, life expectancy, openness in the good market, openness in the capital market and net bilateral aid

The null and alternative hypothesis for the study is stated as follows:

H_0: The Kuznets' hypothesis exist for SSA economies

H_1: The Kuznets' hypothesis does not exist for SSA economies

Variables used in the paper were selected based on various literatures. Each variable has a theoretical underpinning. These theories explain the relationship between income inequality and the selected variable. The relationships are briefly summarized in the table below:

Table 1: Expected signs of the variables

Variables	Theoretical Underpinning	Expected Signs
GDP	The relationship between income inequality and economic growth can be considered with GDP per capita and GDP per capita squared according to the Kuznets hypothesis	-/+
NBIL	According to the Diamond Model (transfers in the model), an increase in aid affect productivity. Whether aid increase or decrease productivity depends on (i) policies (ii) the production technology	-/+
UNEM	Higher unemployment rate will cause inequality to increase	+
HC	Higher human capital causes lower unemployment which will intend induce incomes of poor individuals to increase	-
GM	An opening of the goods markets reduces income inequality	-
CM	An opening of the capital market increases income inequality	+
LEP	One of the results in reducing income inequality is an improvement in life expectancy. '*higher income are associated with better health*' *(Lynch and Kaplan, 2000)*	-

4. Empirical Results

Before an empirical test is conducted to ascertain whether the Kuznets hypothesis holds for SSA countries, a 3D plot of income inequality and economic growth is presented below.

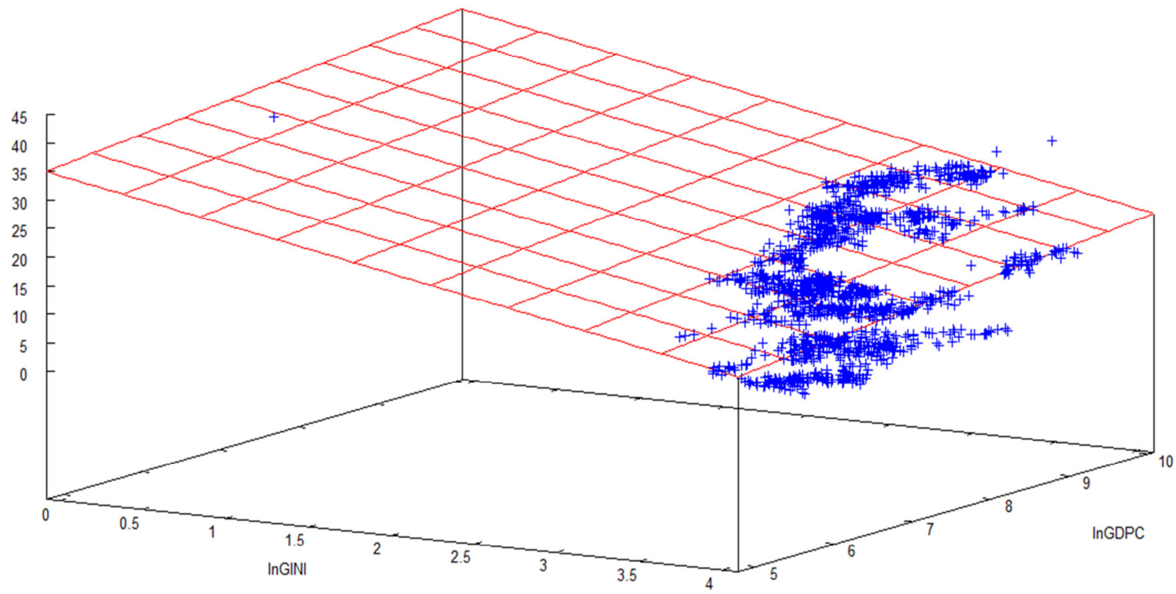


Figure 3: Three Dimensional plot of inequality and economic growth for all SSA countries

Figure 3 above shows a relationship between inequality and growth. This diagram takes into consideration all SSA countries used in the study. One could see two U shaped curves, thus forming an S-curve. This relationship (i.e. the outline of the outcome) is not strongly marked. However having established an element of a U-shaped curve, the study proceeded to undertake an empirical analysis into the theory.

To undertake a correct estimation of the co-efficient, the study firstly determined the order of integration for all variables in all countries by the use of ADF test. This method is undertaken to ensure that no variable is integrated at order 2 i.e. *I(2)* so as to avoid spurious regression. For all countries, variables that are integrated of order 2 are dropped from the estimation. To test the integration order, the study applied the Augmented Dickey-Fuller test. The test results displayed for all the countries indicate that most of the variables are integrated at either order zero *(I(0))* or order 1 *(I(1))*. With the exception of Kenya and Ghana, all the other countries had the variable for human capital not being integrated of order 0 or 1. For such countries, the Human Capital variable was dropped. All countries had the GINI index variable integrated or order 0 or 1. GDP per capita variables for all countries are integrated of either order 0 or 1 except Zimbabwe. The study therefore could not perform any estimation for Zimbabwe. Some countries had life expectancy variable to integrated of either order 0 or 1 whiles other countries do not have.

Unemployment and net bilateral aid variables all follow similar description. For all those individual countries where the variables not I(0) or I(1), such variables are dropped from the estimation. All countries had the variable for good market integrated of order (0) or (1). With the exception of Mozambique, all other countries had their variables for capital market also integrated of order 0 or 1. The order of integration is shown in the tables tilted unit root test for each respective country.

As noted earlier autoregressive distributed lag approach has three steps in estimation. The first step is to select the lag order using Akaike Information Criteria. This is because the F-statistics for cointegration is very sensitive with lag length. For each country, different lag order is selected. But the general rule that runs through is that the lag order with the lowest AIC value is selected. When the appropriate lags are imposed, there is strong evidence of co-integration because the computed F-statistics for each selected lag length for each country is greater than the critical value of the upper level of the bound at 5 percent and 1 percent level of significance.

A summary of the selected lag and its F-statistics for each country is shown in table 2 below. The critical values of the bounds are shown in the appendix in table 133. This indicates that long-run relationships among the variables are evidential. The long-run coefficient using each selected lag length was estimated. The results are presented below

Table 2: F-statistics of the selected lag for each country

Countries	Selected Lag	F-Statistics of Selection lag
Benin	5	13.6728***
Botswana	2	15.2379***
Burkina Faso	4	10.8975***
Burundi	2	8.5338**
Cameroon	2	8.4672***
Cape Verde	2	10.5730***
Central Africa Republic	1	27.6098***
Chad	2	10.2554***
Congo, Democratic Republic	1	8.3163**
Congo Republic	2	9.3574**
Cote D'ivore	3	27.1042***
Gabon	2	19.1880***
Gambia, The	2	15.2870***
Guinea Bissau	1	11.2283***
Kenya	1	8.0133**
Lesotho	2	7.7804**
Liberia	3	9.1528**
Madagascar	3	8.6840**
Malawi	4	21.8012***
Mali	3	9.0116**
Mozambique	1	12.7014***
Mauritania	4	9.6972***
Mauritius	1	23.8217***
Namibia	2	13.2724***
Niger	2	9.6708***
Nigeria	2	7.5155**
Rwanda	3	11.3962***
Senegal	3	9.4230**
Sierra Leone	1	7.6233**
South Africa	1	31.3894***
Togo	1	7.1102**
Zambia	4	13.6062***
Ghana	2	13.3253***

*** 1 percent level of significance ** 5 percent level of significance

4.1 Long Run Analysis

This section presents the result of the long run analysis. Even though a country-by-country methodology is used, the results are presented in a single table to enable us appreciate the various differences.

Table 3: Estimated long run coefficients using the ARDL Approach
Dependent Variable: LNGINI

	Variables								
Countries	LNGDPC	$LNGDPC^2$	$LNGDPC^3$	UNEMP	GM	CM	LNNBILA	LNLIFEXP	HC
Benin	2.5620 (0.0004)***	-0.3076 (0.0602)*	-0.0607 (0.0779)*	---	-0.0131 (0.0009)***	-0.0183 (0.0178)**	-0.1073 (0.0010)***	-90. 6716 (0.0004)***	---
Botswana	4.6655 (0.0095)**	-5.2595 (0.0090)***	2.3492 (0.0086)**	---	0.0069 (0.0194)**	-0.0509 (0.0106)**	0.1255 (0.0086)**	---	---
Burkina Faso	8.2721 (0.0372)**	1.0538 (0.0376)**	-6.2504 (0.0381)**	0.0209 (0. 6229)	0.0032 (0.2499)	-0.0545 (0.1174)	0.1357 (0.0171)**	---	---
Burundi	0.3052 (0.1268)	9.6199 (0.9486)	-0.0419 (0.9498)	---	---	-0.0031 (0.5445)	---	---	---
Cameroon	-6.8357 (0.3486)	-1.7005 (0.0547)**	6.4674 (0.0536)**		-0.0015 (0.4767)	-0.0076 (0.2363)	-0.0360 (0.0018)***	-20.2154 (0.0009)***	
Cape Verde	7.6996 (0.0110)**	-9.9194 (0.0113)**	4.2832 (0.0115)**	0.9243 (0.0322)**	-0.0148 (0.0466)**	---	0.0428 (0.0950)*	-20.2219 (0.0337)**	---
Central African Republic	5.7835 (0.5878)	5.9160 (0.041)**	7.0388 (0.0239)**	0.0370 (0.4551)	-0.0029 (0.0342)**	0.0238 (0.0078)**	0.0064 (0.2063)	-1.2957 (0.0668)*	---
Chad	-6.3867 (0.0361)**	-8.0477 (0.0187)**	4.2332 (0.0185)**	---	-0.0019 (0.2285)	0.0004 (0.7945)	0.0494 (0.0845)*	-8.5786 (0.0067)**	---
Congo, Democratic Republic	19.0623 (0.1336)	-3.2594 (0.1190)	0.1837 (0.1078)	---	-0.0022 (0.0187)**	-0.0026 (0.3410)	0.0104 (0.4906)	0.2167 (0.1417)	---
Congo, Republic	19.1443 (0.0201)**	-24.3156 (0.0186)**	1.030 (0.0171)**	0.0296 (0.7481)	-0.0035 (0.4935)	-0.0018 (0.1501)	-0.0130 (0.2313)	-2.9609 (0.0174)**	---
Cote d'Ivoire	6.4191 (0.3223)	8.9775 (0.3165)	-3.9253 (0.3108)	---	-0.0070 (0.0276)**	-0.0466 (0.0187)**	-0.0465 (0.0330)**	-7.5240 (0.0117)**	---
Gabon	6.5431 (0.1529)	-7.8320 (0.6908)	0.2671 (0.7038)	---	-0.0033 (0.2147)	-0.0134 (0.0948)**	0.0188 (0.1449)	-5.1752 (0.0425)**	---
Gambia, The	2.3763 (0.0695)**	-9.3830 (0.2328)	---	---	-0.0088 (0.0703)**	0.0229 (0.2471)	0.1637 (0.1814)	6.8939 (0.1110)	---
Ghana	0.7543 (0.0001)***	-0.1027 (0.0001)***	0.0046 (0.0001)***	---	-0.0018 (0.0246)**	0.0212 (0.0119)**	0.0214 (0.0021)**	-11.7341 (0.0000)***	-10.5327 (0.0000)***
Guinea-Bissau	3.0320 (0.0254)**	-2.5458 (0.1739)	1.2827 (0.1795)	0.0807 (0.0785)*	-0.0011 (0.0421)**	-0.0187 (0.0122)**	-0.0652 (0.0197)**	---	---
Kenya	-14.631 (0.1014)	-2.7043 (0.0070)**	0.2453 (0.0072)***	0.4815 (0.1361)	0.0055 (0.0222)**	-0.0309 (0.0576)*	-0.0342 (0.0099)***	---	-7.1168 (0.1188)
Lesotho	-3.1340 (0.2403)	0.0220 (0.0175)**	-2.4197 (0.2629)	0.0065 (0.0070)**	-0.0020 (0.0191)**	-0.0003 (0.7666)	0.0419 (0.0394)**	---	
Liberia	39.4147 (0.0712)*	12.3948 (0.0173)**	-0.7175 (0.0168)**	---	-0.0001 (0.3493)	0.0010 (0.0092)***	0.0849 (0.0165)**	---	---
Madagascar	11.7334 (0.0856)*	-1.3238 (0.0842)*	8.5261 (0.0828)*	---	0.0015 (0.2667)	-0.0082 (0.0544)*	-0.0468 (0.0130)**	---	---
Malawi	5.4286 (0.0668)*	-8.1864 (0.0673)*	7.2895 (0.0869)*	---	0.0085 (0.0217)**	-0.0151 (0.1948)	-7.4396 (0.0800)*	---	---
Mali	8.7411 (0.2207)	-0.6782 (0.2186)	1.2326 (0.4758)	---	-0.0100 (0.0034)***	-0.0326 (0.0109)**	-0.0791 (0.0893)*	-5.9904 (0.4063)	---
Mauritania	0.2524 (0.0133)**	-1.3835 (0.0873)*	0.1229 (0.0936)*	---	-0.0023 (0.0431)**	-0.0008 (0.5127)	0.1306 (0.0008)***	11.2811 (0.0007)***	---
Mauritius	0.9528 (0.0209)**	-3.9662 (0.1681)	1.410 (0.1673)	0.0741 (0.0124)**	0.0050 (0.0634)*	0.0624 (0.2040)	-0.0699 (0.0084)**	-11.0692 (0.0653)*	---
Mozambique	6.1643 (0.4659)	1.2485 (0.4403)	-0.6303 (0.4124)	0.0913 (0.1655)	-0.0026 (0.0279)**	---	-0.0321 (0.3355)	-2.9685 (0.0784)*	---
Namibia	-0.4082 (0.0601)*	-9.3949 (0.0156)**	---	0.0045 (0.3359)	0.0073 (0.0171)**	-0.0330 (0.0024)***	0.0353 (0.0600)*	-3.5238 (0.0601)*	---
Niger	0.3705 (0.0335)**	-3.6400 (0.0912)*	1.7410 (0.0901)*	---	-0.0063 (0.0307)**	0.0184 (0.0934)*	0.0097 (0.2980)	---	---
Nigeria	1.9344 (0.0750)*	-2.6768 (0.0706)*	0.1513 (0.0354)**	---	0.0023 (0.0311)**	0.0177 (0.0060)***	0.0554 (0.0080)**	-9.5442 (0.0080)**	---
Rwanda	5.3981 (0.0361)**	0.7545 (0.0086)**	-0.0774 (0.0070)**	---	-0.0089 (0.0071)**	-0.0251 (0.2592)	-0.0406 (0.0696)*	---	---
Senegal	6.2658 (0.0078)***	-4.2260 (0.0071)***	---	---	-0.0045 (0.0297)**	-0.0261 (0.0095)**	-0.0500 (0.0299)**	-1.9344 (0.0737)*	---
Sierra Leone	1.0748 (0.1464)	-2.9647 (0.1449)	1.1037 (0.1436)	---	-0.0022 (0.0340)**	-0.0044 (0.0072)**	0.0365 (0.0075)**	---	---
South Africa	-0.6488 (0.0621)*	-1.1975 (0.4578)	---	0.0066 (0.0572)*	0.0054 (0.0004)***	0.0060 (0.0284)**	0.0492 (0.0127)**	-4.2420 (0.0387)**	---
Togo	0.0874 (0.3454)	1.4573 (0.7768)	-0.8408 (0.7782)	---	-0.0025 (0.0471)**	0.0168 (0.0481)**	0.0294 (0.0503)*	-9.8420 (0.0012)**	---
Zambia	0.3432 (0.0758)*	8.3126 (0.1524)	-0.3711 (0.1648)*	---	0.0021 (0.0453)**	-0.0071 (0.0937)*	0.0094 (0.3265)	-4.2439 (0.0007)***	---

( ) indicate probability values * indicate statistically significant at 10% level of significance ** indicate statistically significant at 5% level of significance
*** indicate statistically significant at 1% level of significance

Source: Author's Estimation, 2016

To investigate the non-linear relationship between income inequality and economic growth, the study included the square-term of GDP per capita in the log-linear model in column 3 in the table above. The hypothesis was found to hold for these countries; Benin, Botswana, Cameroon, Cape Verde, Chad, Congo Democratic Republic, Congo Republic, Gabon, Gambia, Guinea Bissau, Kenya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Namibia, Niger, Nigeria, Senegal, Sierra Leone, South Africa and Ghana. It is proved by List and Gallet (1999) and Tribble (1996, 1999) that the Kuznets inverted U-curve is in fact an S-curve. This can be tested by the inclusion of a cubic term of GDP per capita in the non-linear model. This is shown in column 4 in the table above. An S-curve means that, at the first turning point there is a relationship between income inequality and growth with the change from agricultural sector to manufacturing sector and the second turning point shows the relationship between inequality and growth as structural change is evidenced from manufacturing sector to service sector. All countries listed above showed evidence for invested S-shaped curve against a shaped curve. This result is consistent with Shahbaz (2010) in the case of Pakistan. From table 3 columns 2 above, the result for real GDP per capita is positive and significant for most countries and few countries have negative coefficient. This is in line with Kuznets assertion that lower Gini-coefficient present with lower GDP per capita. Kenya, Namibia, Botswana and South Africa all have negative coefficient for real GDP even though the coefficient for Kenya is not statistically significant. Namibia, Botswana, and South Africa all have significant coefficient. This means that for such countries, higher economic growth will led to a reduction in income inequality in the long run.

The results of human capital do not give a clear picture of human capital development of the SSA countries. With the exception of Ghana and Kenya, the rest of the countries used in the study do not have their human capital variables integrated of either order 0 or 1. The result from both countries reveals that the coefficient of human capital is negative even though that of Kenya is not significant. A negative coefficient underscores the fact that improvement in human capital will led to a reduction in income inequality. But this result cannot be generalized for the entire SSA region even though it supports the theoretical postulations. Theoretically, Lynch and Kaplan (2000), asserts that higher life expectancy are associated with better health. The results are shown in column 9 in the table above. Thus, the study expects the sign for life expectancy to be negative and significant for all countries. Before the results is presented, it was noticed that some countries had this variable not being integrated of order 0 or 1. Those include Botswana, Burkina Faso, Burundi, Congo Democratic Republic, Guinea Bissau, Lesotho, Liberia, Madagascar, Malawi, Namibia, Niger, Rwanda, and Sierra Leone. Apart from these countries mentioned above, the coefficients of the rest of the countries all have negative signs. This means that improvement in life expectancy reduces income inequality. Again, some countries had unemployment coefficient not being integrated of order 0 or 1. However, the countries that have a right integration order all had the expected sign. The coefficient for unemployment is positive meaning a higher unemployment rate also reveal higher income inequality.

The coefficient of the goods market reveals the extent to which international trade affect income inequality. The following countries had a negative coefficient; Benin, Burkina Faso, Cameroon, Cape Verde, Central Africa Republic, Chad, Congo Democratic Republic, Congo Republic, Gabon, Gambia, Guinea Bissau, Lesotho, Liberia, Malawi, Mali, Mozambique, Mauritania, Mauritius, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Togo, Zambia and Ghana. This means that an opening of the goods market reduces income inequality. This may be as a result of higher manufacturing cost in these countries and that only a few rich can afford locally produced goods.

But imports of goods from developed countries will led to a reduction in the prices which the poor can afford. Again, the capital base of the poor may even cause them to be involved in retail trade for these imported commodities. Even though this can be injurious to the growth of the manufacturing sector but the advantage is also gained when these countries get involved in the export of semi-finished and finished goods in areas where they have competitive advantage. Few countries such as Botswana, Kenya, Madagascar, Namibia, South Africa and Cote d'lviore all have positive coefficient. This means that the greater these countries get to open up to trade in goods market, the higher the income inequality. With interest rates of 6%, 11.5%, 8.70%, 7%, 7% and 3.5% respectively, these countries manufacturing sector seem better and thus imports of goods could be injurious. This supposes that, these countries have developed their manufacturing sector to the point that further import from developed countries causes their income inequality to increase through the collapse of their local industries and subsequent lie off the workers.

Some countries had the coefficient of capital market to be positive and others negative. The counties that had a negative capital market coefficient include Benin, Botswana, Burkina Faso, Burundi, Cameroon, Congo Democratic Republic, Congo Republic, Cote D'ivore, Guinea Bissau, Kenya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Namibia, Rwanda, Senegal, Sierra Leone and Zambia. A negative coefficient means that a development of capital market causes income inequality to fall. To some extent, these countries capital markets tend o benefit the poor.

Countries with negative capital market have used strategies such as organizing dead capital for the poor. De Soto (2000) stated that developing countries have a total value of $9.3 trillion in dead capital, which is owned by the poor. The author identified dead capital in forms such as land, equipment, livestock, and absence of property right that can turn these assets into capital. The poor has property not in formal proper system, but in the extralegal, underground system. Shelter-Afrique, a company for housing shown that in Kenya, Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo dead capital could be organized through legally registering rural land and using such lands as collateral for capital raised and issues to the poor. Again, assets-backed asset-backed securitization has been used in such countries to mobilize dead capital by securitizing the loans of a community or rural village. In some countries, companies are formed with the property of a community or village as the asset of the company and members of the community or village as shareholders.

Positive capital market coefficient countries include Cape Verde, Central African Republic, Chad, Gabon, Gambia, Lesotho, Liberia, Niger, Nigeria, South Africa, Togo and Ghana.. The positive capital market coefficient means that there is positive relationship between capital market and inequality. As capital market develops, income inequality also increases.

With the exception of Namibia, Sierra Leone and Zambia, all countries with negative capital market coefficient also have negative net bilateral aid coefficient. A negative coefficient means that an increase in net bilateral aid will reduce income inequality. As these aids better the welfare of the poor, they are able to part take in the activities of the capital market which also affect income difference. The reasoning could be that net bilateral aid may form the foundation capital for acquiring dead capital from the poor.

4.2 Short Run Dynamics

The result of the short-run dynamics are shown in the table below

Table 4: Error Correction Corresponding to the ARDL

Dependent Variable: DLNGINI

Countries			Variables									
	DLNGDPC	DLNLIFEXP	$DLNLIFEXP_{t-1}$	DUNEMP	DGM	DGM_{t-1}	DCM	DCM_{t-1}	DLNNBILA	$DLNNBIL_{t-1}$	HC	ecm_{t-1}
Benin	0.1295 (0.0050)**	-8.6635 (0.0004)***	26.690 (0.0017)***	---	-0.0130 (0.0009)***	-0.0046 (0.0035)**	0.0183 (0.0178)**	0.0009 (0.8196)	-0.1072 (0.0010)***	0.1484 (0.0005)***	---	-0.4581 (0.0197)**
Botswana	0.1767 (0.0819)*	---	---	---	-0.00084 (0.0143)**	---	0.00716 (0.0784)*	-0.0145 (0.0338)**	0.0082 (0.1473)	0.0508 (0.1048)	---	-0.4950 (0.0085)**
Burkina Faso	1.0563 (0.0437)**	---	---	---	-0.0069 (0.0916)*	0.0026 (0. 6501)	0.2190 (0.0198)**	0.2776 (0.0112)**	-0.0801 (0.0831)*	-0.0140 (0.7329)	---	-0.3529 (0.0215)**
Burundi	0.305 (0.1268)	---	---	---	---	---	0.0031 (0.0445)**	---	---	---	---	-0.5245 (0.1121)
Cameroon	-0.4181 (0.0095)**	-12. 6234 (0.0024)**	-11.1526 (0.0051)**	---	0.0074 (0.0020)**	---	0.0019 (0.0857)*	0.0060 (0.2449)	0.0189 (0.1588)	0.0360 (0.0018)***	---	-0.5266 (0.0020)**
Cape Verde	1.1730 (0.0489)**	33.9202 (0.0574)*	-34.3989 (0.0638)*	---	-0.0122 (0.0601)*	---	0.0183 (0.0599)*	-0.0535 (0.1618)	0.0828 (0.5530)	-0.0565 (0.1349)	---	-0.6929 (0.0020)**
Central African Republic	0.0966 (0.2299)	-1.2957 (0.0668)*	---	0.0253 (0.0668)*	-0.0029 (0.0342)**	---	0.0238 (0.0078)**	---	-0.0064 (0.2063)	---	---	-0.4550 (0.0076)**
Chad	-0.1968 (0.0156)**	-8.5786 (0.0067)**	-8.5165 (0.0049)**	---	-0.0014 (0.0344)**	---	0.0010 (0.5519)	---	---	---	---	-0.5889 (0.0000)***
Congo, Democratic Republic	0.0302 (0.7211)	---	---	-0.2167 (0.1417)	-0.0007 (0.0389)**	---	0.0022 (0.0141)**	---	-0.0119 (0.3390)	---	---	-0.3193 (0.0000)***
Congo, Republic	0.0642 (0.2786)	-10.3535 (0.0178)**	-11.2364 (0.0177)**	---	0.0013 (0.0699)**	---	0.0005 (0.0736)**	---	-0.0130 (0.2313)	---	---	-0.7187 (0.0000)***
Cote d'Iviore	0.5204 (0.0406)**	-19.9581 (0.2741)	---	---	-0.0008 (0.0518)*	-0.0056 (0.1067)	0.0772 (0.0027)**	0.0406 (0.0335)**	0.0006 (0.9625)	-0.0303 (0.0801)*	---	-0.6102 (0.0031)**
Gabon	0.3606 (0.0043)**	-5.1080 (0.0031)**	---	---	-0.0012 (0.3219)	---	0.0030 (0.0027)**	-0.0121 (0.0123)**	-0.0218 (0.0550)*	-0.0188 (0.0437)**	---	-0.8188 (0.0001)***
Gambia, The	1.6357 (0.1171)	---	---	---	-0.0109 (0.0901)*	0.0088 (0.0703)*	0.0171 (0.0014)***	0.0208 (0.2621)	-13.5537 (0.0042)**	---	---	-0.6142 (0.0089)**
Ghana	0.3376 (0.0928)*	-14.5221 (0.0502)*	---	---	-0.0028 (0.0429)**	---	0.0116 (0.0100)**	---	0.0163 (0.2574)	---	12.9232 (0.0428)**	-0.7910 (0.0004)***
Guinea-Bissau	0.0956 (0.0543)*	---	---	0.1261 (0.0137)**	-0.0011 (0.0421)**	---	-0.0187 (0.0122)**	---	0.0652 (0.0197)**	---	---	-0.5102 (0.0009)***
Kenya	-0.4602 (0.0878)*	4.3049 (0.4563)	---	0.2173 (0.4011)	-0.0030 (0.0595)*	---	-0.0018 (0.0086)**	---	---	---	---	-0.2548 (0.0731)*
Lesotho	-1.5022 (0.0020)**	---	---	---	-0.0018 (0.0673)*	0.0004 (0.4613)	0.0030 (0.0183)**	---	0.0329 (0.0201)**	0.0201 (0.3938)	---	-0.5924 (0.0007)***
Liberia	0.2375 (0.0435)**	---	---	---	-0.0010 (0.0351)**	0.00061 (0.0957)*	0.0002 (0.0394)**	0.0009 (0.2255)	0.0690 (0.0592)*	0.0955 (0.0257)**	---	-0.4284 (0.0086)**
Madagascar	21.3927 (0.0137)**	---	---	---	-0.0027 (0.0973)*	---	0.0099 (0.0211)**	---	-0.0369 (0.0528)*	---	---	-0.4109 (0.0000)***
Malawi	6.0054 (0.0409)**	---	---	---	-0.0123 (0.0289)**	-0.0091 (0.2649)	0.0196 (0.0158)**	0.0572 (0.0295)**	-0.0332 (0.4220)	-0.1417 (0.0979)*	---	-0.3822 (0.0238)**
Mali	7.31334 (0.0496)**	-2.2309 (0.0653)*	---	---	-0.0024 (0.0013)**	-0.0088 (0.0008)***	0.0068 (0.3545)	0.0278 (0.0039)**	-0.0300 (0.2243)	0.0377 (0.1349)	---	-0.7569 (0.0024)**
Mauritania	4.2783 (0.0120)**	-12.7940 (0.0272)**	---	---	-0.0013 (0.1232)	---	0.0022 (0.0880)*	---	0.0535 (0.0112)**	-0.0618 (0.0004)***	---	-0.4122 (0.0000)***
Mauritius	0.2244 (0.0799)*	-17.3598 (0.0227)**	---	0.1162 (0.0859)*	0.0110 (0.0914)*	---	-0.0971 (0.0402)**	---	-0.1096 (0.0499)**	---	---	-0.6376 (0.0099)**
Mozambique	6.4323 (0.0255)**	-11.2401 (0.0806)*	---	0.0831 (0.2100)	0.0024 (0.0904)*	---	---	---	-0.0137 (0.7757)	---	---	-0.5133 (0.0112)**
Namibia	-0.3727 (0.2039)	-3.5238 (0.0601)*	---	---	0.0051 (0.0232)**	---	0.0129 (0.1408)	---	0.0308 (0.0419)**	---	---	-0.5575 (0.0006)***
Niger	5.0684 (0.0285)**	---	---	---	-0.0044 (0.1005)	0.0097 (0.0011)**	0.0010 (0.0236)**	---	0.0163 (0.0876)*	---	---	-0.8051 (0.0001)***
Nigeria	3.1102 (0.0413)**	-9.0151 (0.3893)	---	---	-0.0022 (0.0879)*	---	0.0093 (0.0489)**	---	0.0226 (0.1178)	---	---	-0.7184 (0.0041)**
Rwanda	15.3979 (0.0021)**	---	---	---	-0.0067 (0.0768)*	---	0.0708 (0.0081)**	---	-0.0551 (0.0815)*	---	---	-0.4153 (0.0002)***
Senegal	4.7218 (0.0033)**	-1.6791 (0.0162)**	---	---	-0.0039 (0.0902)*	---	-0.0027 (0.0517)*	---	0.0026 (0.8937)	0.0033 (0.8575)	---	-0.5218 (0.0000)***
Sierra Leone	1.1311 (0.1465)	---	---	---	0.0020 (0.0581)*	---	-0.0010 (0.4705)	---	0.0398 (0.0041)**	---	---	-0.6167 (0.0000)***
South Africa	-0.8808 (0.0621)*	-4.2420 (0.0387)**	---	0.0064 (0.0555)*	-0.0054 (0.0004)***	---	0.0060 (0.0284)**	---	-0.0492 (0.0127)**	---	---	-0.4192 (0.0000)***
Togo	1.6753 (0.1744)	-2.5469 (0.0077)**	---	9.8653 (0.0017)**	-0.0020 (0.0789)*	---	0.0034 (0.0528)*	---	-0.0003 (0.9821)	----	---	-0.3930 (0.0001)***
Zambia	11.2444 (0.0169)**	-2.5653 (0.0058)**	---	---	-0.0002 (0.8668)	0.0054 (0.0243)*	0.0087 (0.3196)	---	-0.0182 (0.3038)	---	---	-0.5611 (0.0031)**

( ) indicate probability values * indicate statistically significant at 10% level of significance ** indicate statistically significant at 5% level of significance
*** indicate statistically significant at 1% level of significance

Source: Author, 2016

After this, our attention to turned to the short run dynamics and thus estimates the short-run version of ARDL for all countries. A summary of the results is displayed in Table 3. The coefficient of Error Correction

Term (ECM) shows the speed of adjustment from short-run to long-run equilibrium. The ECM term should have a negative sign and be highly significant. Bannerjee al 1998 stated that the ECM term gives an indication of a proof of a stable long run relationship. The ECM term is also an efficient way of establishing cointegration. On average the coefficient of ecm_{t-1} term for SSA countries is -0.51 for the short-run models. This means any deviation from short run in income inequality is corrected by 51 percent over each year in long span of time.

Short-run results also show that for some countries inequality increases with an increase in real per capita income and decrease with an increase in real per capita income. With the exception of South Africa, all countries had the same sign for both short and long run result for LNGDPC variable.

Life expectancy variable had a negative sign indicating that even in the short run improved life expectancy will reduce income inequality. Therefore, health intervention programs should be encouraged. Unemployment remained positive in the short run dynamics. This means that regardless of whether the economy is in the short or long run, unemployment increases income inequality. In the short run, the goods market variable tends to increase income inequality for some countries and a decrease inequality for others.

Net bilateral aid was positive for most countries in the short run dynamics. From this result, the study could infer that in the short run, net bilateral aid may have little impact on income inequality. This could also be supported with the fact that most coefficients are not significant. The impact of net bilateral aid are felt when these aid eventually gets to the hands of the individuals.

The ARDL results for the various countries passed the diagnostic tests against serial correlation, autoregressive conditional heteroskedasticity and normality of error term.

5. Conclusion and Recommendation

5.1 Conclusions

The following conclusions could be drawn from the results. With the exception of Kenya and Ghana, all the other countries had the variable for human capital not being integrated of order 0 or 1. All the countries have the GINI index and GDP per capita variables, integrated of order 0 or 1 with the exception of Zimbabwe. For the rest of the countries, some variables were integrated of order 0 while others were integrated of order 1. In estimating the ARDL, different lag length using AIC was selected.

The result for real GDP per capita is positive and significant for most countries and few countries have negative coefficient. With the exception of Ghana and Kenya, the rest of the countries used in the study do not have their human capital variables integrated of either order 0 or 1. The result from both countries reveals that the coefficient of human capital is negative even though that of Kenya is not significant. Life expectancy variable was negative and significant for countries that were integrated of order 0 or 1. The coefficient for unemployment is positive for all countries. For some countries, the good market coefficient was negative whiles others were positive. The same could be said for the coefficient of the capital market. Countries with negative capital market coefficient also have negative net bilateral aid coefficient. Out of 37 countries used in the study, 24 of these countries supported the Kuznets inverted U curve. The short run dynamics also showed that, on average the coefficient of ecm_{t-1} term for SSA countries is equal to 0.51.

5.2 Policy Recommendations

In terms of policy implication, the following is recommendation should be noted. Attention should be given to the human capital needs of these countries, even though the variable for human capital is not conclusive enough. Human capital formation through education and skills should be given the necessary consideration. Public policy should therefore promote wider access to educational opportunities as a means of increasing income-earning potential for more people. But the mere provision of greater access to education is no guarantee that the poor will be better off unless complementary policies such as the provision of more productive employment opportunities for the educated are adopted to capitalize on this increased human capital.

The above recommendation partly addresses the issue of unemployment, which is another contributory factor towards income inequality. But a well designed work program could be adopted even when education is absent. For instance, the poor could be put to work in building infrastructure such as roads from outlaying areas (where the poor lives) to market towns, that will ultimately benefit the poor and the skills of the workers significantly lower than would be the case with a commercially procured construction contract. In many cases, these valuable infrastructure projects would never be tackled at all in the absence of such program. The high working requirement and very modest payment discourage the non-poor from participating, thus conserving resources. Such programs are known as the screening functions of workfare programs and have been adopted under the Maharashtra Employment Guarantee Scheme in India (Todaro and Smith, 2012).

Governments should pay close attention to capital market. The poor could be made to benefit from capital markets through the utilization of dead capital. According to Todaro and Smith (2012), the ultimate cause of the unequal distribution of personal incomes in most developing countries is the unequal and highly concentrated patterns of assets ownership. Assets here are defined as physical capital, land, and financial resources such as stocks and bonds. The poor may not have any of these, but may have land. The problem here is not about ownership of assets, but its usefulness. The basic idea is to transform poor tenants' cultivators into small and medium holders of capital. This could be done through the model of Shelter-Afrique already described above. This could be done effectively through capital markets.

Net bilateral aid flows could be a major seed capital to finance work programs and injected into the capital market as a major source of liquidating dead capital. This capital could be put into judicious use and the poor is made to have a share in these facilities.

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APPENDIX

Table 1

List of Sub-Sahara African Countries used in the study

Benin	Congo, Democratic Republic	Lesotho	Namibia	Zambia
Botswana	Congo, Republic	Liberia	Niger	Zimbabwe
Burkina Faso	Cote d'Iviore	Madagascar	Nigeria	
Burundi	Gabon	Malawi	Rwanda	
Cameroon	Gambia, The	Mali	Senegal	
Cape Verde	Ghana	Mauritania	Togo	
Central African Republic	Guinea-Bissau	Mauritius	Sierra Leone	
Chad	Kenya	Mozambique	South Africa	

BENIN

Table 2: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-3.6476	0.0081	---	---
LNGDPC	-2.0226	0.2765	-7.8284	0.0000
LNHC	-1.7558	0.3977	1.4145	0.5679***
LNLIFEXP	-8.5190	0.0000	---	---
UNEMP	-3.1288	0.0405	-6.2928	0.0000
GM	-1.7269	0.4118	-8.1316	0.0000
CM	-3.5095	0.0125	-5.8213	0.0000
LNNBILA	-3.1787	0.0271	-9.1651	0.0000

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 3: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.8149	-2.4839	4.0588
2	-3.1216	-2.6994	6.0979
3	-3.1216	-2.6994	6.0979
4	-2.7563	-2.0750	2.7913
5	-7.8775	-6.3972	13.6728***

*** Lag selection is based on the minimum value of AIC.

Table 4: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	2.5620	0.0004	9.4139	0.0808
$LNGDPC^2$	---	---	-0.3076	0.0602
$LNGDPC^3$	---	---	-0.0607	0.0779
LNLIFEXP	-9. 6716	0.0004	-8.8287	0.0282
LNNBILA	-0.1073	0.0010	---	---
GM	-0.0131	0.0009	---	---
CM	-0.0183	0.0178	---	---
	R^2= 0.999 Adjusted R^2=0.9904 AIC = -7.8775 F-statistics = 102. 8748 Prob (F-Stats) = 0.00115		R^2= 0.4738 Adjusted R^2=0.3553 AIC = -2.7644 F-statistics = 4.0013 Prob (F-Stats) = 0.00104	

Table 5: Error-correction corresponding to ARDL (4,5,4,5,5,5)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	0.1295	0.0803	1.6138	0.0050
DLNLIFEXP	-8.6635	0.5526	-15.6777	0.0004
$DLNLIFEXP_{t-1}$	26.690	2.8399	9.3982	0.0017
LNNBILA	-0.1072	0.0083	12.8687	0.0010
$LNNBILA_{t-1}$	0.1484	0.0091	16.1715	0.0005
DGM	-0.0130	0.0097	-13.3595	0.0009
DGM_{t-1}	-0.0046	0.0005	-8.4310	0.0035
DCM	-0.0183	0.0038	-4.7428	0.0178
DCM_{t-1}	0.0009	0.0039	0.2487	0.8196
ecm_{t-1}	-0.4581	0.1000	-4.587	0.0197

BOTSWANA

Table 6: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-5.1234	0.0001	---	---
LNGDPC	-1.5720	0.4894	-7.1667	0.0000
LNHC	-1.4202	0.5651	-1.9587	0.3036***
LNLIFEXP	-1.3063	0. 6197	-1.3636	0.5923***
UNEMP	-2.1171	0.2403	-4. 6906	0.0017
GM	-2.3526	0.1601	-9.4451	0.0000
CM	-4.4437	0.0011	---	---
LNNBILA	-1.7713	0.3873	-5.7305	0.0001

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 7: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.1629	-1.7702	2.9059
2	-4.7606	-3.8184	15.2379***

*** Lag selection is based on the minimum value of AIC.

Table 8: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value
LNGDPC	4.6655	0.0095
$LNGDPC^2$	-5.2595	0.0090
$LNGDPC^3$	2.3492	0.0086
LNNBILA	0.1255	0.0086
GM	0.0069	0.0194
CM	-0.0509	0.0106
	R^2 = 0.989 Adjusted R^2 = 0.924 AIC = -4.7606 F-statistics = 15.23 Prob (F-Stats) = 0.0225	

Table 9: Error-correction corresponding to ARDL (1, 2, 2,1, 2, 2, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	0.1767	0.1240	1.4251	0.0819
LNNBILA	0.0082	0.0251	0.3304	0.1473
$LNNBILA_{t-1}$	0.0508	0.0287	1.7677	0.1048
DGM	-0.00084	0.0004	-2.8001	0.0143
DCM	-0.00716	0.0040	-1.7901	0.0784
DCM_{t-1}	-0.0145	0.0059	-2.4238	0.0338
ecm_{t-1}	-0.4950	0.1627	-3.0424	0.0085

BURKINA FASO

Table 10: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.7120	0.0004	---	---
LNGDPC	-0.1287	0.9494	-8.1279	0.0000
LNLIFEXP	-1.3063	0. 6197	-1.3636	0.5923***
UNEMP	-1.1603	0. 6700	-8.1812	0.0000
GM	-0.2583	0.9237	-7.8742	0.0000
CM	-2.0851	0.2515	-9.3437	0.0000
LNNBILA	-1.7759	0.3879	-8.3386	0.0000

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 11: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-3.2770	-2.7799	1. 0652
2	-3.7661	-2.9766	3.5982
3	-3.9243	-2.9999	5.8489
4	-4.5883	-3.3687	10.8975

*** Lag selection is based on the minimum value of AIC.

Table 12: Long run Coefficient using ARDL Method

Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.3543	0.3643	8.2721	0.0372	1.1756	0.0167
$LNGDPC^2$	---	---	1.0538	0.0376	---	---
$LNGDPC^3$	---	---	-6.2504	0.0381	---	---
LNNBILA	0.0004	0.9919	---	---	0.1357	0.0171
GM	-0.0032	0.5360	0.0032	0.2499	-0.0157	0.0506
CM	-0.0175	0. 6106	-0.0545	0.1174	-0.2776	0.0112
UMEMP	0.0209	0. 6229	---	---	---	---
	R^2 = 0.5157 Adjusted R^2 = 0.0315 AIC = -3.2897 F-Statistics = 4.0652 Prob (F-Stats) = 0.4632		R^2 = 0.3953 Adjusted R^2 = 0.2850 AIC = -2.7458 F-Statistics = 5.5960 Prob (F-Stats) = 0.0074		R^2 = 0.9390 Adjusted R^2 = 0. 6440 AIC = -3. 6883 F-Statistics = 9.1865 Prob (F-Stats) = 0.0754	

Table 13: Error-correction corresponding to ARDL (4,4,4,4,4,4,4)

Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	1.0563	0.4147	2.5470	0.0437
LNNBILA	-0.0801	0.0404	-1.9827	0.0831
$LNNBILA_{t-1}$	-0.0140	0.3941	0.3759	0.7329
DGM	-0.0069	0.0040	-1.7250	0.0916
DGM_{t-1}	0.0026	0.0055	0.4771	0.6501
DCM	-0.2190	0.0695	-3.1508	0.0198
DCM_{t-1}	0.2776	0.7691	3. 6095	0.0112
ecm_{t-1}	-0.3529	0.1350	-2.6140	0.0215

BURUNDI

Table 14: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-1.4182	0.5571	-5.6604	0.0001
LNGDPC	-2.1660	0.2209	-6.5721	0.0000
LNLIFEXP	-0.1100	0.9425	-0.8847	0.7849***
UNEMP	-1.3400	0.5910	-3.3100	0.0282
GM	-5.6772	0.0001	---	---
CM	-2.5921	0.1010	-7.0343	0.0000
LNNBILA	-1.9486	0.3080	-2.2353	0.1972***
LNHC	-0.1068	0.9428	-1.9789	0.2949***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 15: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.9684	-2.4748	6.3454
2	-3.9103	-2.6178	8.5338***

*** Lag selection is based on the minimum value of AIC.

Table 16: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.2910	0.0694	0.3047	0.0795	0.3052	0.1268
$LNGDPC^2$	---	---	---	---	9.6199	0.9486
$LNGDPC^3$	---	---	---	---	-0.0419	0.9498
GM	---	---	---	---	---	---
CM	-0.0033	0.4456	-0.0030	0.5099	-0.0031	0.5445
	R^2 = 0.6322 Adjusted R^2 = 0.5355 AIC = -3.7103 F-Statistics = 8.5338 Prob (F-Stats) = 0.0010		R^2 = 0.6336 Adjusted R^2 = 0.5115 AIC = -2.834 F-Statistics = 7.1883 Prob (F-Stats) = 0.0029		R^2 = 0.6352 Adjusted R^2 = 0.4529 AIC = -2.6785 F-Statistics = 6.4836 Prob (F-Stats) = 0.0160	

Table 17: Error-correction corresponding to ARDL (1, 2, 0, 0, 0, 0)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-0.3050	0.1595	-1.9122	0.0568
DCM	-0.0031	0.0050	-0.6191	0.4445
ecm_{t-1}	-0.5245	0.2585	-2.0290	0.0121

CAMEROON

Table 18: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-9.9968	0.0000	---	---
LNGDPC	-1.7294	0.4107	-5.3525	0.0000
LNLIFEXP	-5.6999	0.0000	---	---
UNEMP	-2.1763	0.2198	-6.7535	0.0000
GM	-2.0081	0.2826	-8.2259	0.0000
CM	-2.5139	0.1211	-11.7672	0.0000
LNNBILA	-4. 6496	0.0004	---	---
LNHC	-2.3084	0.1734	-0.1922	0.9324***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 19: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-3.7503	-2.9802	5.4067
2	-4.1739	-3.0101	8.4672

*** Lag selection is based on the minimum value of AIC.

Table 20: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.8914	0.0000	-6.8357	0.3486
$LNGDPC^2$	---	---	-1.7005	0.0547
$LNGDPC^3$	---	---	6.4674	0.0536
GM	-0.0074	0.0020	-0.0015	0.4767
CM	-0.0072	0.1445	-0.0076	0.2363
LNLIFEXP	-2.6499	0.0037	-20.2154	0.0009
LNNBILA	-0.0360	0.0018	---	---
	R^2 = 0. 9759 Adjusted R^2 =0.9546 AIC = -3.9370 F-Statistics = 15.9034 Prob (F-Stats) = 0.0000		R^2 = 0.8468 Adjusted R^2 = 0.7128 AIC = -3.4634 F-Statistics = 6.3183 Prob (F-Stats) = 0.0003	

Table 21: Error-correction corresponding to ARDL (2, 1, 2, 1, 2, 2)

Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	0.4181	0.1431	2.9209	0.0095
DCM	-0.0019	0.0011	-1.7272	0.0857
DCM_{t-1}	0.0060	0.0049	1.2045	0.2449
DLNNBILA	0.0189	0.0128	1.4736	0.1588
$DLNNBILA_{t-1}$	0.0360	0.0097	3.7065	0.0018
DGM	0.0074	0.0020	-3.6520	0.0020
DLNLIFEXP	12. 6234	3.0620	4.1225	0.0024
$DLNLIFEXP_{t-1}$	-11.1526	3.0876	-3.6120	0.0051
ecm_{t-1}	-0.5266	0.1440	-3. 6568	0.0020

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Table 22: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-3. 6814	0.0086	---	---
LNGDPC	0.3398	0.9782	-4. 6263	0.0005
LNLIFEXP	-5.3739	0.0000	---	---
UNEMP	-0.3870	0.8946	-4.0824	0.0056
GM	-1.8648	0.3439	-5.1305	0.0002
CM	-1.7922	0.3758	-4.7661	0.0009
LNNBILA	-3.0446	0.0399	-4.9558	0.0003

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 23: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.6499	-2.2541	4.2807
2	-3.8725	-3.3413	10.5730

*** Lag selection is based on the minimum value of AIC.

Table 24: Long run Coefficient using ARDL Method

Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	1.1730	0.0655	7.6996	0.0110	0.0885	0.6824
$LNGDPC^2$	---	---	-9.9194	0.0113	---	---
$LNGDPC^3$	---	---	4.2832	0.0115	---	---
GM	-0.0171	0.1425	-0.0148	0.0466	---	---
CM	0.0535	0.1618	---	---	---	---
LNLIFEXP	-6.4971	0.0587	-20.2219	0.0337	---	---
LNNBILA	0.0565	0.1349	0.0428	0.0950	0.0945	0.0136
UNEMP	---	---	---	---	0.9243	0.0322
	R^2 = 0.9733 Adjusted R^2 = 0.7471 AIC = -3.9202 F-Statistics = 7.3027 Prob (F-Stats) = 0.0204		R^2 = 0.9418 Adjusted R^2 = 0.7210 AIC = -3.5266 F-Statistics = 7.2642 Prob (F-Stats) = 0.0575		R^2 = 0.9548 Adjusted R^2 = 0.8645 AIC = -3.8725 F-Statistics = 11.5730 Prob (F-Stats) = 0.0089	

Table 25: Error-correction corresponding to ARDL (1, 2, 1, 2, 2, 2, 2, 1)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	1.1730	0.3158	3.7136	0.0489
DCM	0.0183	0.0050	3.6601	0.0599
DCM_{t-1}	-0.0535	0.0246	-2.1737	0.1618
DLNNBILA	0.0828	0.1172	0.7066	0.5530
$DLNNBILA_{t-1}$	-0.0565	0.0231	-2.4388	0.1349
DGM	-0.0122	0.0040	-3.0500	0.0601
DLNLIFEXP	33.9202	9.0179	3.7614	0.0574
$DLNLIFEXP_{t-1}$	-34.3989	9.0454	-3.8029	0.0638
ecm_{t-1}	-0.6929	0.1203	-5.7597	0.0020

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Table 26: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.7085	0.0004	---	---
LNGDPC	-1.0547	0.7262	-8.5622	0.0000
LNLIFEXP	-6.3046	0.0000	---	---
UNEMP	-3.5029	0.0184	-7.9310	0.0000
GM	-2.2971	0.1767	-8.4649	0.0000
CM	-1.7086	0.4180	-8.4666	0.0000
LNNBILA	-3.5347	0.0109	-9. 6265	0.0000
LNHC	-2.1089	0.2422	-1.13318	0.6956***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 27: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-6.3885	-5.8004	27.6098

*** Lag selection is based on the minimum value of AIC.

Table 28: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	-5.7835	0.5878	-0.2586	0.0097
$LNGDPC^2$	5.9160	0.041	---	---
$LNGDPC^3$	7.0388	0.0239	---	---
GM	-0.0006	0.7839	-0.0029	0.0342
CM	0.0086	0.4372	0.0238	0.0078
UNEMP	---	---	0.0370	0.4551
LNLIFEXP	---	---	-1.2957	0.0668
LNNBILA	---	---	0.0064	0.2063
	R^2 = 0.6950 Adjusted R^2 = 0.5425 AIC = -3.0503 F-Statistics = 9.5582 Prob (F-Stats) = 0.0019		R^2 = 0.9838 Adjusted R^2 = 0.9481 AIC = -6.3885 F-Statistics = 25.5018 Prob (F-Stats) = 0.0009	

Table 29: Error-correction corresponding to ARDL (1, 1, 0, 0, 1, 1, 1)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	0.0966	0.0707	1.366	0.2299
DCM	0.0238	0.0055	4.2903	0.0078
DUNEMP	0.0253	0.0120	2.1083	0.0668
DLNNBILA	-0.0064	0.0044	-1.4517	0.2063
DGM	-0.0029	0.0010	-2.8890	0.0342
DLNLIFEXP	-1.2957	0.5550	-2.3345	0.0668
ecm_{t-1}	-0.4550	0.1074	-4.2364	0.0076

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Table 30: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-3.6476	0.0081	---	---
LNGDPC	-1.8857	0.3363	-3.3219	0.0193
LNLIFEXP	-2.8945	0.0531	---	---
UNEMP	-3.4576	0.0202	-4.7312	0.0015
GM	-1.2239	0. 6572	-11.3598	0.0000
CM	-3.8424	0.0060	---	---
LNNBILA	-1.8726	0.3423	-7.3036	0.0000

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 31: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	2.6280	2.3169	5.9598
2	-3.9269	-2.9331	10.2554***

*** Lag selection is based on the minimum value of AIC.

Table 32: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	-0.1968	0.0156	-6.3867	0.0361
$LNGDPC^2$	---	---	-8.0477	0.0187
$LNGDPC^3$	---	---	4.2332	0.0185
GM	-0.0014	0.2255	-0.0019	0.2285
CM	0.0018	0.2933	0.0004	0.7945
LNLIFEXP	-8.5786	0.0067	---	---
LNNBILA	---	---	0.0494	0.0845
	R^2 = 0.8491 Adjusted R^2 = 0.7966 AIC = -2.9269 F-Statistics = 6.2554 Prob (F-Stats) = 0.0019		R^2 = 0.8815 Adjusted R^2 = 0.7302 AIC = -2.7669 F-Statistics = 7.7114 Prob (F-Stats) = 0.0211	

Table 33: Error-correction corresponding to ARDL (1, 1, 1, 1, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-0.1968	0.0753	-2.6127	0.0156
DCM	0.0010	0.0017	0.6038	0.5519
DGM	-0.0014	0.0006	-2.3333	0.0444
DLNLIFEXP	8.5786	3.0295	2.8316	0.0067
$DLNLIFEXP_{t-1}$	-8.5165	2.4407	-3.4893	0.0049
ecm_{t-1}	-0.5889	0.0990	-5.9484	0.0000

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Table 34: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	4.7085	0.0004	---	---
LNGDPC	-0.9372	0.7683	-7.2289	0.0000
LNLIFEXP	-2.2689	0.1853	-1.0323	0.7345***
UNEMP	-1.8321	0.3557	-5.4792	0.0003
GM	-0.4816	0.8862	-6.8092	0.0000
CM	1.0653	0.9965	-6.6710	0.0000
LNNBILA	-2.3398	0.1639	-5.2629	0.0001
LNHC	-2.2078	0.2062	-0.9288	0.7709***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 35: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-4.9304	-3.4357	8.3163***

*** Lag selection is based on the minimum value of AIC.

Table 36: Long run Coefficient using ARDL Method

Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.1230	0.2031	19.0623	0.1336
$LNGDPC^2$	---	---	-3.2594	0.1190
$LNGDPC^3$	---	---	0.1837	0.1078
GM	-0.0010	0.2234	-0.0022	0.0187
CM	-0.0022	0.1141	-0.0026	0.3410
LNNBILA	-0.0119	0.1639	0.0104	0.4906
UNEMP	0.2167	0.1417	---	---
	R^2 = 0.9034 Adjusted R^2 = 0.7948 AIC = -4.9304 F-Statistics = 8.3163 Prob (F-Stats) = 0.0033		R^2 = 0.7848 Adjusted R^2 = 0.6910 AIC = -3.1067 F-Statistics = 6.2385 Prob (F-Stats) = 0.0001	

Table 37: Error-correction corresponding to ARDL (1, 1, 0, 1, 1, 0)

Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-0.0302	0.0818	-0.3697	0.7211
DCM	-0.0022	0.0012	-1.7731	0.0141
DUNEMP	-0.2167	0.1329	-1.6302	0.1417
DLNNBILA	-0.0119	0.0050	-2.3800	0.0339
DGM	-0.0007	0.0003	-2.3333	0.0389
ecm_{t-1}	-0.3193	0.0379	-8.3687	0.0000

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Table 38: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-3. 6487	0.0081	---	---
LNGDPC	-1.4727	0.5392	-6.7784	---
LNLIFEXP	-5.3165	0.0000	---	---
UNEMP	-1.5318	0.4983	-5.5532	0.0003
GM	-0.4069	0.8999	-10.3625	0.0000
CM	-1.4629	0.5395	-5.1642	0.0002
LNNBILA	-4. 6887	0.0004	---	---
LNHC	-2.4979	0.1220	-0.7807	0.8158***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 39: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	2.5310	2.2864	4.9598
2	-3.8239	-2.9331	9.3574***

*** Lag selection is based on the minimum value of AIC.

Table 40: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.0642	0.2786	19.1443	0.0201
$LNGDPC^2$	---	---	-24.3156	0.0186
$LNGDPC^3$	---	---	1.030	0.0171
GM	0.0013	0.0963	-0.0035	0.4935
CM	-0.0005	0.9736	-0.0018	0.1501
LNLIFEXP	-2.9609	0.0174	---	---
LNNBILA	-0.0130	0.2313	---	---
UNEMP	---	---	0.0296	0.7481
	R^2 = 0.6730 Adjusted R^2 = 0.5451 AIC = -3.0147 F-Statistics = 7.2619 Prob (F-Stats) = 0.0006		R^2 = 0.9227 Adjusted R^2 = 0.7681 AIC = -3.6617 F-Statistics = 7.9703 Prob (F-Stats) = 0.0030	

Table 41: Error-correction corresponding to ARDL (1, 2, 2, 2, 1, 1, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-0.0642	0.05789	-1.10957	0.2786
DCM	0.0005	0.0002	1.6666	0.0736
DLNNBILA	-0.0130	0.0106	-1.2295	0.2313
DGM	0.0013	0.0007	1.7338	0.0699
DLNLIFEXP	10.3535	4.0213	2.5746	0.0178
$DLNLIFEXP_{t-1}$	-11.2364	4.1540	-2.7049	0.0177
ecm_{t-1}	-0.7187	0.1001	-7.1798	0.0000

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Table 42: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.7047	0.0004	---	---
LNGDPC	-0.7049	0.8362	-6.3413	0.0000
LNLIFEXP	-4.9386	0.0002	---	---
UNEMP	-6.8913	0.0000	---	---
GM	-0.9092	0.7776	-8.0705	0.0000
CM	-2.3957	0.1498	-7.6689	0.0000
LNNBILA	-3.0312	0.0386	-10.7218	0.0000
LNHC	-1.9810	0.2940	-1.2581	0.6418***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 43: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-3.1565	-2.7030	-5.5878
2	-3.5338	-2.6635	8.4418
3	-6.0076	-4.7587	27.1042

*** Lag selection is based on the minimum value of AIC.

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Table 44: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.5204	0.0406	6.4191	0.3223
$LNGDPC^2$	---	---	8.9775	0.3165
$LNGDPC^3$	---	---	-3.9253	0.3108
GM	-0.0065	0.0227	-0.0070	0.0276
CM	-0.07725	0.0027	-0.0466	0.0187
LNLIFEXP	-7.1285	0.2104	-7.5240	0.0117
LNNBILA	-0.0465	0.0330	---	---
UNEMP	---	---	---	---
	R^2 = 0.9943 Adjusted R^2 = 0.9576 AIC = -6.0076 F-Statistics = 25.0030 Prob (F-Stats) = 0.0027		R^2 = 0.9094 Adjusted R^2 = 0.7448 AIC = -3.666 F-Statistics = 8.523 Prob (F-Stats) = 0.0028	

Table 45: Error-correction corresponding to ARDL (3, 3, 3, 2, 3, 3, 3)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-0.5204	0.1743	-2.9844	0.0406
DCM	0.0772	0.0116	6.6473	0.0027
DCM_{t-1}	0.0406	0.0127	3.1815	0.0335
DLNNBILA	0.0006	0.01289	0.0500	0.9625
$DLNNBILA_{t-1}$	-0.0303	0.0130	-2.3311	0.0801
DGM	-0.0008	0.0025	-2.5806	0.0518
DGM_{t-1}	-0.0056	0.0027	-2.0743	0.1067
DLNLIFEXP	-19.9581	16.3014	-1.2243	0.2741
ecm_{t-1}	-0.6102	0.1010	-6.0415	0.0031

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Table 46: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.5606	0.0006	---	---
LNGDPC	-1. 7921	0.3801	-5.7193	0.0000
LNLIFEXP	-3.2710	0.0217	---	---
UNEMP	-3.2569	0.0314	-4. 6309	0.0019
GM	-3.7990	0.0052	---	---
CM	-2. 6507	0.0931	-4.9488	0.0004
LNNBILA	-5.3065	0.0000	---	---
LNHC	-2.3967	0.1478	-0.4333	0.8951***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 47: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-3.1804	-2.7522	6.5961
2	-5.9893	-4.8280	19.1880***

*** Lag selection is based on the minimum value of AIC.

Table 48: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.3606	0.0043	6.5431	0.1529
$LNGDPC^2$	---	---	-7.8320	0.6908
$LNGDPC^3$	---	---	0.2671	0.7038
GM	-0.0017	0.2252	-0.0033	0.2147
CM	0.0121	0.0123	-0.0134	0.0948
LNLIFEXP	-16.3513	0.0282	-5.1752	0.0425
LNNBILA	0.0188	0.0437	0.0188	0.1449
UNEMP	---	---	---	---
	R^2 = 0.9800 Adjusted R^2 = 0.9167 AIC = -4.8090 F-Statistics = 15.4919 Prob (F-Stats) = 0.0013		R^2 = 0.9954 Adjusted R^2 = 0.9436 AIC = -5.9893 F-Statistics = 19.1880 Prob (F-Stats) = 0.0506	

Table 49: Error-correction corresponding to ARDL (2, 2, 1, 2, 2, 2, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-0.3606	0.0809	-4.4561	0.0043
DCM	0.0030	0.0006	5.0001	0.0027
DCM_{t-1}	-0.0121	0.0034	-3.5346	0.0123
DLNNBILA	-0.0218	0.0091	-2.3767	0.0550
$DLNNBILA_{t-1}$	-0.0188	0.0074	-2.5470	0.0437
DGM	-0.0012	0.0011	-1.0793	0.3219
DLNLIFEXP	5.1080	1.2189	4.1906	0.0031
ecm_{t-1}	-0.8188	0.1101	-7.4368	0.0001

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Table 50: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.4020	0.0010	---	---
LNGDPC	-1.4472	0.5519	-5.9303	0.0000
LNLIFEXP	-6.3206	0.0000	---	---
UNEMP	-3.5099	0.0181	-5.1373	0.0007
GM	-1.5815	0.4838	-8.2256	0.0000
CM	-2.2885	0.1833	-8.0436	0.0000
LNNBILA	-3.4737	0.0146	-7.4855	0.0000
LNHC	-0.4699	0.8882	-1.9719	0.2979***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 51: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-3.3501	-2.9522	6.9002
2	-6.0201	-4.9985	15.2870***

*** Lag selection is based on the minimum value of AIC.

Table 52: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	2.3763	0.0695	4.0278	0.9650
$LNGDPC^2$	---	---	-9.3830	0.2328
$LNGDPC^3$	---	---	---	---
GM	-0.0088	0.0703	---	---
CM	0.0229	0.2471	---	---
LNLIFEXP	6.8939	0.1110	---	---
LNNBILA	---	---	0.1637	0.1814
UNEMP	---	---	---	---
	R^2 = 0.8735 Adjusted R^2 = 0.7627 AIC = -3.0443 F-Statistics = 14.1264 Prob (F-Stats) = 0.0002		R^2 = 0.9906 Adjusted R^2 = 0.7749 AIC = -5.1511 F-Statistics = 19.5937 Prob (F-Stats) = 0.0008	

Table 53: Error-correction corresponding to ARDL (1, 2, 2, 2, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-1.6357	0.8210	-1.9923	0.1171
DCM	0.0171	0.0191	0.8950	0.0014
DCM_{t-1}	0.0208	0.0159	1.3043	0.2621
DGM	-0.0109	0.0049	-2.2249	0.0901
DGM_{t-1}	0.0088	0.0035	2.4517	0.0703
DLNLIFEXP	-13.5537	5.3206	-2.5470	0.0042
ecm_{t-1}	-0.6142	0.1261	-4.8412	0.0089

GUINEA BISSAU

Table 54: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.5038	0.0008	---	---
LNGDPC	-2.1357	0.2320	-8.5254	0.0000
LNLIFEXP	-0.4309	0.8955	-2.3312	0.1666***
UNEMP	-4.8216	0.0010	---	---
GM	-3.8375	0.0053	-8.1502	0.0000
CM	-4.9831	0.0004	---	---
LNNBILA	-3.1061	0.0350	-10.9014	0.0000

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 55: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-4.7507	-4.4465	11.2283***

*** Lag selection is based on the minimum value of AIC.

Table 56: Long run Coefficient using ARDL Method
Dependent Variables = LNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.3614	0.1632	3.0320	0.0254
$LNGDPC^2$	---	---	-2.5458	0.1739
$LNGDPC^3$	---	---	1.2827	0.1795
GM	-0.0011	0.0421	---	---
CM	-0.0187	0.0122	---	---
LNNBILA	-0.0652	0.0197	---	---
UNEMP	0.0807	0.0785	---	---
	R^2 = 0.8087 Adjusted R^2 = 0.6174 AIC = -4.7507 F-Statistics = 10.1153 Prob (F-Stats) = 0.0014		R^2 = 0.5441 Adjusted R^2 = 0.4748 AIC = -2.7430 F-Statistics = 5.7629 Prob (F-Stats) = 0.0154	

Table 57: Error-correction corresponding to ARDL (1, 1, 1, 0, 1, 1)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-0.0956	0.0410	-2.3317	0.0543
DCM	-0.0187	0.0052	-3.5374	0.0122
DLNNBILA	0.0652	0.0206	3.1538	0.0197
DUNEMP	0.1261	0.0362	3.4772	0.0137
DGM	-0.0011	0.0004	-2.5742	0.0421
ecm_{t-1}	-0.5102	0.0671	-7.5585	0.0009

KENYA

Table 58: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.6734	0.0004	---	---
LNGDPC	-1.4463	0.5520	-6. 6539	0.0000
LNLIFEXP	-4.9235	0.0002	---	---
UNEMP	-0. 6741	0.8316	-8.3155	0.0000
GM	-2.7778	0.0684	-8.2757	0.0000
CM	-7.1268	0.0000	---	---
LNNBILA	-3.0940	0.0360	-8.3571	0.0000
LNHC	-2.9888	0.0428	---	---

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 59: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-5.0866	-4.5555	8.0133***

*** Lag selection is based on the minimum value of AIC.

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Table 60: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	-0.2282	0.1032	-14.631	0.1014
$LNGDPC^2$	---	---	-2.7043	0.0070
$LNGDPC^3$	---	---	0.2453	0.0072
GM	0.0070	0.0369	0.0055	0.0222
CM	-0.0140	0.1743	-0.0309	0.0576
LNLIFEXP	-3.1883	0.0193	---	---
LNNBILA	---	---	-0.0342	0.0099
UNEMP	0.4815	0.1361	---	---
LNHC	---	---	-7.1168	0.1188
	R^2 = 0.9220 Adjusted R^2 = 0.7661 AIC = -5.0866 F-Statistics = 8.9153 Prob (F-Stats) = 0.0316		R^2 = 0.7730 Adjusted R^2 = 0.6177 AIC = -3.2451 F-Statistics = 4.9777 Prob (F-Stats) = 0.0008	

Table 61: Error-correction corresponding to ARDL (1, 1, 1, 1, 1, 1)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	0.4602	0.2036	2.2603	0.0878
DCM	-0.0018	0.0004	-4.5000	0.0086
DGM	-0.0030	0.0011	-2.7272	0.0595
DLNLIFEXP	4.3049	5.2258	0.8237	0.4563
DUNEMP	-0.2173	0.2315	-0.9386	0.4011
ecm_{t-1}	-0.2548	0.0951	-2.6792	0.0731

LESOTHO

Table 62: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.4020	0.0010	---	---
LNGDPC	-1.4945	0.5280	-6.2027	0.0000
LNLIFEXP	-0.9023	0.7795	-1.2245	0.6566***
UNEMP	-0.5220	0.8663	-6.0677	0.0001
GM	-1.7324	0.4093	-7.7654	0.0000
CM	-2.5367	0.1160	-4. 6411	0.0007
LNNBILA	-1.1929	0. 6676	-10.3115	0.0000
LNHC	-0.5692	0.8680	-1.9133	0.3237***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 63: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.4532	-2.9874	4.7895
2	-3.8485	-3.0197	7.7804***

*** Lag selection is based on the minimum value of AIC.

Table 64: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.9424	0.0044	-3.1340	0.2403	-0.2811	0.1110
$LNGDPC^2$	---	---	0.0220	0.0175	---	---
$LNGDPC^3$	---	---	-2.4197	0.2629	---	---
GM	-0.0040	0.0040	-0.0020	0.0191	---	---
CM	0.0063	0.0223	-0.0003	0.7666	---	---
LNNBILA	0.1175	0.0131	0.0419	0.0394	---	---
UNEMP	---	---	---	---	0.0065	0.0070
	R^2 = 0.9396 Adjusted R^2 = 0.8188 AIC = -3.8485 F-Statistics = 7.7804 Prob (F-Stats) = 0.0031		R^2 = 0.8306 Adjusted R^2 = 0.6976 AIC = -3.2836 F-Statistics = 6.2440 Prob (F-Stats) = 0.0010		R^2 = 0.9290 Adjusted R^2 = 0.8049 AIC = --5.4577 F-Statistics = 7.4868 Prob (F-Stats) = 0.0351	

Table 65: Error-correction corresponding to ARDL (2, 1, 2, 2, 2, 1, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-1.5022	0.2877	-5.2214	0.0020
DCM	-0.0030	0.0009	-3.2149	0.0183
DGM	-0.0018	0.0007	-2.5714	0.0673
DGM_{t-1}	0.0004	0.0005	0.7867	0.4613
DLNNBILA	0.0329	0.0106	3.1037	0.0201
$DLNNBILA_{t-1}$	0.0201	0.0219	0.9185	0.3938
ecm_{t-1}	-0.5924	0.0845	-7.0023	0.0007

LIBERIA

Table 66: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-1.4933	0.5210	5.6775	0.0001
LNGDPC	-1.9166	0.3219	-3.2071	0.0261
LNLIFEXP	-1.5765	0.4870	-1.1229	0. 6995***
UNEMP	-1.8133	0.3641	-4.0847	0.0059
GM	-2.1759	0.2173	-6. 6989	0.0000
CM	-4.9051	0.0002	---	---
LNNBILA	0.2681	0.9729	-8.2481	0.0000
LNHC	-0. 6242	0.8550	-2.2109	0.2053***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 67: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.6716	-2.3827	3.8874
2	2.9894	2.8535	5.8970
3	-3.8709	-2.9969	9.1528***

*** Lag selection is based on the minimum value of AIC.

Table 68: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.1817	0.0103	39.4147	0.0712
$LNGDPC^2$	---	---	12.3948	0.0173
$LNGDPC^3$	---	---	-0.7175	0.0168
GM	-0.0001	0.3493	---	---
CM	0.0010	0.0092	---	---
LNNBILA	0.0849	0.0165	---	---
UNEMP	---	---	---	---
	R^2 = 0.8616 Adjusted R^2 = 0.6541 AIC = -3.1709 F-Statistics = 7.1528 Prob (F-Stats) = 0.0140		R^2 = 0.9513 Adjusted R^2 = 0.7200 AIC = -3.8610 F-Statistics = 6.1142 Prob (F-Stats) = 0.0896	

Table 69: Error-correction corresponding to ARDL (3, 3, 3, 3, 3, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-0.2375	0.0509	-4.6660	0.0435
DCM	0.0002	0.00027	0.9575	0.4394
DCM_{t-1}	0.0009	0.0005	1.7313	0.2255
DGM	0.0010	0.00019	5.1984	0.0351
DGM_{t-1}	0.00061	0.00022	2.7493	0.0957
DLNNBILA	0.0690	0.0175	3.9269	0.0592
$DLNNBILA_{t-1}$	0.0955	0.0156	6.1212	0.0257
ecm_{t-1}	-0.4284	0.0400	-10.7123	0.0086

MADAGASCAR

Table 70: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.9195	0.0002	---	---
LNGDPC	-0.4156	0.8984	-6.5393	0.0000
LNLIFEXP	-0.8295	0.8018	-1.4718	0.5394***
UNEMP	-2.9608	0.0561	-4.3962	0.0034
GM	-0. 6473	0.8502	-10.6851	0.0000
CM	-0.4270	0.8946	-4.5583	0.0007
LNNBILA	-2. 6154	0.0964	-6.8370	0.0000

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 71: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.7747	-2.5240	3.0106
2	-3.8326	-2.9983	5.9482
3	-4.5611	-3.9760	8.6840***

*** Lag selection is based on the minimum value of AIC.

Table 72: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.2979	0.0119	11.7334	0.0856
$LNGDPC^2$	---	---	-1.3238	0.0842
$LNGDPC^3$	---	---	8.5261	0.0828
GM	0.0021	0.1538	0.0015	0.2667
CM	-0.0044	0.2508	-0.0082	0.0544
LNNBILA	-0.0302	0.1324	-0.0468	0.0130
UNEMP	---	---	---	---
	R^2 = 0.7642 Adjusted R^2 = 0.6734 AIC = -3.7747 F-Statistics = 7.0106 Prob (F-Stats) = 0.0055		R^2 = 0.8937 Adjusted R^2 = 0.74582 AIC = -4.9786 F-Statistics = 8.3838 Prob (F-Stats) = 0.0007	

Table 72: Error-correction corresponding to ARDL (3, 3, 3, 3, 3, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-21.3927	8.2275	-2.6001	0.0137
DCM	-0.0099	0.0041	-2.4173	0.0211
DGM	0.0027	0.0013	1.9681	0.0973
DLNNBILA	-0.0369	0.0184	-2.0068	0.0528
ecm_{t-1}	-0.4109	0.0433	-9.4896	0.0000

MALAWI

Table 73: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-3.6443	0.0080	---	---
LNGDPC	-1.771	0.3901	-6.0557	0.0000
LNLIFEXP	-0.8692	0.7899	-0.4139	0.8985***
UNEMP	-3.0996	0.0421	-8.7945	0.0000
GM	-1.8237	0.3651	-6.5180	0.0000
CM	-3.7117	0.0074	---	---
LNNBILA	-1.6954	0.4244	-9.3368	0.0000
LNHC	-0.9807	0.7533	-2.0019	0.2851***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 74: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.7849	-2.4843	4.2283
2	-2.7632	-2.4184	3.7522
3	-2.7743	-2.4295	7.8419
4	-7.6262	-6.2384	21.8012***

*** Lag selection is based on the minimum value of AIC.

Table 75: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	20.8125	0.0797	5.4286	0.0668
$LNGDPC^2$	---	---	-8.1864	0.0673
$LNGDPC^3$	---	---	7.2895	0.0869
GM	0.0696	0.0716	0.0085	0.0217
CM	-1.3177	0.0805	-0.0151	0.1948
LNNBILA	-7.4396	0.0800	---	---
UNEMP	---	---	---	---
	R^2 = 0.9991 Adjusted R^2 = 0.9753 AIC = -7.6262 F-Statistics = 19.0832 Prob (F-Stats) = 0.0121		R^2 = 0.9088 Adjusted R^2 = 0.6628 AIC = -3.4769 F-Statistics = 7.6943 Prob (F-Stats) = 0.0173	

Table 76: Error-correction corresponding to ARDL (3, 3, 3, 3, 3, 3, 3)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	6.0054	2.1576	2.7833	0.0409
DCM	0.0196	0.0141	1.3939	0.2158
DCM_{t-1}	0.0572	0.0172	3.3140	0.0295
DGM	0.0123	0.0037	3.3386	0.0289
DGM_{t-1}	-0.0091	0.0036	-2.5262	0.0649
DLNNBILA	-0.0332	0.0372	-0.8937	0.4220
$DLNNBILA_{t-1}$	-0.1417	0.0659	-2.1504	0.0979
ecm_{t-1}	-0.3822	0.1099	-3.4777	0.0238

MALI

Table 77: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.9195	0.0002	---	---
LNGDPC	-0.4747	0.8872	-7.3911	0.0000
LNLIFEXP	-4.1825	0.0017	---	---
UNEMP	-2.0051	0.2825	-5.2802	0.0004
GM	-1.9525	0.3060	-6.9324	0.0000
CM	-3.2954	0.0216	-8.0530	0.0000
LNNBILA	-3.9350	0.0036	---	---
LNHC	-0.0242	0.9516	-2.0109	0.2814***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 78: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.8330	-2.4020	3.6113
2	-3.9907	-2.9736	5.2800
3	-5.4494	-4.6657	9.0116***

*** Lag selection is based on the minimum value of AIC.

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Table 79: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.2005	0.0826	8.7411	0.2207
$LNGDPC^2$	---	---	-0.6782	0.2186
$LNGDPC^3$	---	---	1.2326	0.4758
GM	-0.0039	0.0075	-0.0100	0.0034
CM	-0.0228	0.0040	-0.0326	0.0109
LNNBILA	-0.0379	0.0436	-0.0791	0.0893
UNEMP	---	---	---	---
LNLIFEXP	---	---	-5.9904	0.4063
	R^2 = 0.8432 Adjusted R^2 = 0.7029 AIC = -3.4494 F-Statistics = 6.0116 Prob (F-Stats) = 0.0009		R^2 = 0.9414 Adjusted R^2 = 0.6987 AIC = -3.7853 F-Statistics = 5.8797 Prob (F-Stats) = 0.0346	

Table 80: Error-correction corresponding to ARDL (3, 3, 3, 3, 3, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-7.31334	2.7497	-2.6596	0.0496
DCM	-0.0068	0.0070	-0.9630	0.3545
DCM_{t-1}	0.0278	0.0078	3.5609	0.0039
DGM	0.0024	0.0006	4.0000	0.0013
DGM_{t-1}	-0.0088	0.0020	-4.4139	0.0008
DLNNBILA	-0.0300	0.0235	-1.2813	0.2243
$DLNNBILA_{t-1}$	0.0377	0.0235	1.6031	0.1349
DLNLIFEXP	2.2309	0.9786	2.2796	0.0653
ecm_{t-1}	-0.7569	0.1976	-3.8302	0.0024

MOZAMBIQUE

Table 81: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.7085	0.0004	---	----
LNGDPC	0.9205	0.9950	-3.2543	0.0229
LNLIFEXP	-6.4127	0.0000	---	---
UNEMP	-2.4043	0.1536	-6.6192	0.0000
GM	-0.6587	0.8431	-4.4441	0.0014
CM	4.9181	1.0000	1.3806	0.9984***
LNNBILA	-4.2075	0.0022	---	---
LNHC	-1.9900	0.2902	-2.1296	0.2343***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 82: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-5.2127	-4.7676	12.7014***

*** Lag selection is based on the minimum value of AIC.

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Table 83: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.4106	0.0176	6.1643	0.4659
$LNGDPC^2$	---	---	1.2485	0.4403
$LNGDPC^3$	---	---	-0.6303	0.4124
GM	-0.0035	0.0016	-0.0026	0.0279
LNNBILA	-0.0437	0.0683	-0.0321	0.3355
UNEMP	0.1175	0.0272	0.0913	0.1655
LNLIFEXP	-4.7460	0.0337	-2.9685	0.0784
	R^2 = 0.9186 Adjusted R^2 = 0.8463 AIC = -5.2127 F-Statistics = 12.7014 Prob (F-Stats) = 0.0004		R^2 = 0.8734 Adjusted R^2 = 0.7610 AIC = -4.7714 F-Statistics = 7.7681 Prob (F-Stats) = 0.0029	

Table 84: Error-correction corresponding to ARDL (1, 1, 1, 1, 1, 1, 0)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	6.4323	2.5694	2.5034	0.0255
DGM	0.0024	0.0016	1.4904	0.0904
DLNNBILA	-0.0137	0.0451	-0.3048	0.7757
DLNLIFEXP	-11.2401	9.0166	-1.2465	0.2806
DUNEMP	-0.0831	0.0904	-0.9193	0.4100
ecm_{t-1}	-0.5133	0.1219	-4.2108	0.0112

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Table 85: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.5785	0.0004	---	---
LNGDPC	-3.6856	0.0073	---	---
LNLIFEXP	-6.5124	0.0000	---	---
UNEMP	-0.2614	0.9155	-4.5720	0.0020
GM	0.0718	0.9604	-7.1004	0.0000
CM	-3.2935	0.0215	-6.4382	0.0000
LNNBILA	-2.2774	0.1830	8.1387	0.0000
LNHC	-2.4701	0.1287	-1.4212	0.5646***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 86: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.9719	-2.5880	4.5584
2	-3.4005	-2.7475	5.9932
3	-3.7143	-2.7906	6.4517
4	-4.4031	-3.2594	9.6972***

*** Lag selection is based on the minimum value of AIC.

Table 87: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.9048	0.0014	0.2524	0.0133
$LNGDPC^2$	---	---	-1.3835	0.0873
$LNGDPC^3$	---	---	0.1229	0.0936
GM	-0.0033	0.0245	-0.0023	0.0431
CM	-0.0034	0.0351	-0.0008	0.5127
LNNBILA	0.1306	0.0008	---	---
UNEMP	---	---	---	---
LNLIFEXP	11.2811	0.0007	---	---
	R^2 = 0.9603 Adjusted R^2 = 0.8613 AIC = -4.4031 F-Statistics = 9.6972 Prob (F-Stats) = 0.0003		R^2 = 0.6990 Adjusted R^2 = 0.5654 AIC = -3.8675 F-Statistics = 5.7351 Prob (F-Stats) = 0.0038	

Table 88: Error-correction corresponding to ARDL (1, 1, 2, 2, 0, 1, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	4.2783	1.2508	3.4204	0.0120
DCM	0.0022	0.0011	1.9995	0.0880
DGM	-0.0013	0.0008	-1.6031	0.1232
DLNNBILA	0.0535	0.0193	2.7678	0.0112
$DLNNBILA_{t-1}$	-0.0618	0.0147	-4.2074	0.0004
DLNLIFEXP	-12.7940	5.4752	2.3367	0.0272
ecm_{t-1}	-0.4122	0.0445	-9.2629	0.0000

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Table 89: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.5896	0.0007	---	---
LNGDPC	-1.3066	0.6197	-6.8738	0.0000
LNLIFEXP	-1.1642	0.6829	-3.8119	0.0052
UNEMP	-2.9709	0.0550	-3. 6682	0.0140
GM	-1.7395	0.4035	-5.7541	0.0000
CM	-1.2253	0. 6519	-7.2242	0.0000
LNNBILA	-1.7941	0.3775	-7.1236	0.0000
LNHC	-1.0308	0.7353	-2.4105	0.1440***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 90: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-7.4692	-7.2939	23.8217***

*** Lag selection is based on the minimum value of AIC.

Table 91: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.1431	0.2106	3.4945	0.1697	0.9528	0.0209
$LNGDPC^2$	---	---	-3.9662	0.1681	---	---
$LNGDPC^3$	---	---	1.410	0.1673	---	---
GM	0.0070	0.1430	0.0050	0.0634	-0.0050	0.0509
CM	-0.0619	0.0665	0.0624	0.2040	0.1002	0.0880
LNNBILA	-0.0699	0.0084	---	---	-0.0962	0.0696
UNEMP	0.0741	0.0124	---	---	---	---
LNLIFEXP	-11.0692	0.0653	---	---	23.4885	0.0200
	R^2 = 0.9940 Adjusted R^2 = 0.9523 AIC = -7.4692 F-Statistics = 23.8217 Prob (F-Stats) = 0.0156		R^2 = 0.9465 Adjusted R^2 = 0.7646 AIC = -3.8820 F-Statistics = 15.2052 Prob (F-Stats) = 0.0085		R^2 = 0.9845 Adjusted R^2 = 0.9022 AIC = -5.0369 F-Statistics = 11.9588 Prob (F-Stats) = 0.0120	

Table 92: Error-correction corresponding to ARDL (1, 0, 0, 0, 0, 0, 0)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	0.2244	0.0700	3.2044	0.0799
DCM	-0.0971	0.0200	-4.8459	0.0402
DGM	0.0110	0.0038	2.9000	0.0914
DLNNBILA	-0.1096	0.0263	-4.1679	0.0499
UNEMP	0.1162	0.0349	3.3262	0.0859
DLNLIFEXP	17.3598	3.3865	5.1261	0.0227
ecm_{t-1}	-0.6376	0.0959	-6.6459	0.0099

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Table 93: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-8.1572	0.0000	---	---
LNGDPC	-2.6670	0.0868	-6.5896	0.0000
LNLIFEXP	-3.4260	0.0146	---	---
UNEMP	-2.8384	0.0700	-5.3936	0.0003
GM	-2.0899	0.2498	-5.4536	0.0001
CM	-2.1053	0.2442	-4.9362	0.0006
LNNBILA	-2.3654	0.1607	-4.7137	0.0010
LNHC	-2.2842	0.1809	-1.3343	0. 6065***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 94: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-6.4002	-5.0101	13.2724***

*** Lag selection is based on the minimum value of AIC.

Table 95: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	-0.4082	0.0601	-14.8386	0.0230
$LNGDPC^2$	---	---	-9.3949	0.0156
$LNGDPC^3$	---	---	---	---
GM	0.0073	0.0171	0.0048	0.1938
CM	-0.0330	0.0024	-0.0060	0.2220
LNNBILA	0.0353	0.0600	---	---
UNEMP	---	---	0.0045	0.3359
LNLIFEXP	-3.5238	0.0601	---	---
	R^2 = 0.9879 Adjusted R^2 = 0.9620 AIC = -8.2990 F-Statistics = 35.2442 Prob (F-Stats) = 0.00003		R^2 = 0.9207 Adjusted R^2 = 0.79612 AIC = -4.2867 F-Statistics = 10.3899 Prob (F-Stats) = 0.0069	

Table 96: Error-correction corresponding to ARDL (1, 1, 1, 1, 0, 1)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	0.3727	0.2660	1.4010	0.2039
DCM	0.0129	0.0077	1.6605	0.1408
DGM	0.0051	0.0017	2.8925	0.0232
DLNNBILA	0.0308	0.0123	2.4851	0.0419
DLNLIFEXP	3.5238	1.5736	2.2392	0.0601
ecm_{t-1}	-0.5575	0.0849	-6.5665	0.0006

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Table 97: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.8236	0.0002	---	---
LNGDPC	-0.7986	0.8109	-7.0448	0.0000
LNLIFEXP	1.5484	0.9992	-2.1199	0.2830***
UNEMP	-1.8310	0.3557	-6.8148	0.0000
GM	-0.6243	0.8558	-5.6708	0.0000
CM	-2.1802	0.2163	-4.0274	0.0033
LNNBILA	-0.8373	0.7914	-6.0415	0.0000
LNHC	-0.0748	0.9464	-2.0655	0.2591***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 98: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.4198	-2.1277	1.5597
2	-4.1934	-3.3646	9.6708***

*** Lag selection is based on the minimum value of AIC.

Table 99: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.4624	0.0042	0.3705	0.0335
$LNGDPC^2$	---	---	-3.6400	0.0912
$LNGDPC^3$	---	---	1.7410	0.0901
GM	-0.0114	0.0024	-0.0063	0.0307
CM	0.0184	0.0934	-0.0013	0.6491
LNNBILA	0.0097	0.2980	---	---
UNEMP	---	---	---	---
	R^2 = 0.9508 Adjusted R^2 = 0.8525 AIC = -4.1934 F-Statistics = 9.6708 Prob (F-Stats) = 0.0014		R^2 = 0.6765 Adjusted R^2 = 0.5899 AIC = -3.9553 F-Statistics = 7.6255 Prob (F-Stats) = 0.0019	

Table 100: Error-correction corresponding to ARDL (1, 2, 2, 2, 0, 0)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	5.0684	4.0797	1.2423	0.2285
DCM	0.0010	0.0035	0.2915	0.7736
DGM	-0.0044	0.0025	-1.7218	0.0985
DGM_{t-1}	0.0097	0.0025	3.7905	0.0011
DLNNBILA	0.0163	0.0091	1.7962	0.0876
ecm_{t-1}	-0.8051	0.1683	-4.7820	0.0001

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Table 101: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.8745	0.0002	---	---
LNGDPC	-1.2694	0.6367	-4.5504	0.0006
LNLIFEXP	-2.8703	0.0561**	---	---
UNEMP	-1.8310	0.3557	-6.8148	0.0000
GM	-2.2296	0.1986	-8.5824	0.0000
CM	-3. 6369	0.0090	---	---
LNNBILA	-0.8373	0.7914	-6.0415	0.0000

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*
** Statistically significant at 10 percent level of significance

Table 102: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.9874	-2.0101	4.7892
2	-4.3636	-3.4309	7.5155

*** Lag selection is based on the minimum value of AIC.

Table 103: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.0523	0.6441	1.9344	0.0750
$LNGDPC^2$	---	---	-2.6768	0.0706
$LNGDPC^3$	---	---	0.1513	0.0354
GM	-0.0050	0.0606	0.0023	0.0311
CM	0.0207	0.0254	0.0177	0.0060
LNNBILA	0.0554	0.0487	---	---
UNEMP	---	---	---	---
LNLIFEXP	-9.5442	0.0080	---	---
	R^2 = 0.9643 Adjusted R^2 = 0.8360 AIC = -4.3636 F-Statistics = 7.5155 Prob (F-Stats) = 0.0173		R^2 = 0.6044 Adjusted R^2 = 0.5725 AIC = -2.7174 F-Statistics = 5.4451 Prob (F-Stats) = 0.0246	

Table 104: Error-correction corresponding to ARDL (3, 3, 3, 2, 2, 3)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-3.1102	1.3934	-2.2319	0.0413
DCM	0.0093	0.0041	2.2682	0.0481
DGM	-0.0022	0.0012	-1.8255	0.0879
DLNNBILA	0.0226	0.0136	1.6595	0.1178
DLNLIFEXP	-9.0151	10.7258	-0.8405	0.3893
ecm_{t-1}	-0.7184	0.1440	-4.9888	0.0041

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Table 105: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-3.7476	0.0072	---	---
LNGDPC	-2.3513	0.1605	-6.7730	0.0000
LNLIFEXP	0.1245	0.9646	-1.3997	0.5749***
GM	-2.8696	0.0559	-10.0048	0.0000
CM	-1.9950	0.2879	-7. 6412	0.0000
LNNBILA	-2.8207	0.0624	-12.8471	0.0000
LNHC	-2.0374	0.2704	-1.1157	0.7026***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 106: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.9781	-1.9850	4.7935
2	-4.8371	-3.7926	7.9644
3	-5.0897	-4.4277	11.3962***

*** Lag selection is based on the minimum value of AIC.

Table 107: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.3501	0.0018	5.3981	0.0361
$LNGDPC^2$	---	---	0.7545	0.0086
$LNGDPC^3$	---	---	-0.0774	0.0070
GM	-0.0098	0.0135	-0.0089	0.0071
CM	-0.0338	0.1778	-0.0251	0.2592
LNNBILA	-0.0480	0.0706	-0.0406	0.0696
	R^2 = 0.6566 Adjusted R^2 = 0.5277 AIC = -4.8041 F-Statistics = 7.8684 Prob (F-Stats) = 0.0096		R^2 = 0.7172 Adjusted R^2 = 0.6540 AIC = -4.0897 F-Statistics = 7.3962 Prob (F-Stats) = 0.0004	

Table 108: Error-correction corresponding to ARDL (1, 2, 2, 3, 2, 3, 0)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-15.3979	4.3188	-3.5652	0.0021
DCM	0.0708	0.0394	1.7981	0.0881
DGM	-0.0067	0.0036	-1.8710	0.0768
DLNNBILA	-0.0551	0.0300	-1.8393	0.0815
ecm_{t-1}	-0.4153	0.0604	-6.8758	0.0002

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Table 109: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.2711	0.0013	---	---
LNGDPC	-1.4460	0.5522	-7.3030	0.0000
LNLIFEXP	-3.9378	0.0036	---	---
GM	-1.6835	0.4335	-7.4822	0.0000
CM	-1.9138	0.3229	-11.2511	0.0000
LNNBILA	-6.3891	0.0000	---	---
LNHC	-0.1250	0.9407	-2.2194	0.2022***
UNEMP	-4.4302	0.0029	---	---

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 110: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.3213	-1.9879	3.7995
2	-3.7854	-2.9790	6.8978
3	-5.2780	-4.1896	9.4230***

*** Lag selection is based on the minimum value of AIC.

Table 111: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.9850	0.0151	6.2658	0.0078
$LNGDPC^2$	---	---	-4.2260	0.0071
$LNGDPC^3$	---	---	---	---
GM	-0.0051	0.0935	-0.0045	0.0297
CM	-0.0385	0.0790	-0.0261	0.0095
LNNBILA	-0.0500	0.0299	---	---
LNLIFEXP	-1.9344	0.0737	---	---
	R^2 = 0.8725 Adjusted R^2 = 0.6176 AIC = -5.2780 F-Statistics = 8.4230 Prob (F-Stats) = 0.0051		R^2 = 0.8027 Adjusted R^2 = 0.6350 AIC = -4.2647 F-Statistics = 7.7876 Prob (F-Stats) = 0.0006	

Table 112: Error-correction corresponding to ARDL (2, 2, 2, 1, 0, 2, 2, 0)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	4.7218	1.4223	3.3196	0.0033
DCM	-0.0027	0.0131	-2.0625	0.0517
DGM	-0.0039	0.0022	-1.7761	0.0902
DLNNBILA	0.0026	0.0196	0.1352	0.8937
$DLNNBILA_{t-1}$	0.0033	0.0186	0.1818	0.8575
DLNLIFEXP	-1.6791	0.6423	-2.6139	0.0162
ecm_{t-1}	-0.5218	0.1001	-5.2127	0.0000

SIERRA LEONE

Table 113: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-3.7453	0.0072	---	---
LNGDPC	-2.0941	0.2479	-4.5936	0.0005
LNLIFEXP	-2.1510	0.2264	-1.3197	0.6132***
GM	-2.2671	0.1862	-6.2821	0.0000
CM	-4.2423	0.0017	---	---
LNNBILA	-1.3655	0.5869	-6.2782	0.0000
LNHC	-1.3615	0.5934	-1.6843	0.4327***
UNEMP	-2.9154	0.0612	---	---

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 114: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-3.2660	-2.8620	7.6233***

*** Lag selection is based on the minimum value of AIC.

Table 115: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.0013	0.9847	1.0748	0.1464
$LNGDPC^2$	---	---	-2.9647	0.1449
$LNGDPC^3$	---	---	1.1037	0.1436
GM	-0.0021	0.0405	-0.0022	0.0340
CM	-0.0010	0.4823	-0.0044	0.0072
LNNBILA	0.0433	0.0002	0.0365	0.0075
UNEMP	---	---	---	---
	R^2 = 0.7092 Adjusted R^2 = 0.6162 AIC = -3.266 F-Statistics = 7.6233 Prob (F-Stats) = 0.00003		R^2 = 0.7379 Adjusted R^2 = 0.6240 AIC = -3.2524 F-Statistics = 6.4779 Prob (F-Stats) = 0.00010	

Table 116: Error-correction corresponding to ARDL (2, 2, 2, 1, 0, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-1.1311	2.4354	-0.4644	0.6465
DCM	-0.0010	0.0014	-0.7332	0.4705
DGM	0.0020	0.0010	1.9901	0.0581
DLNNBILA	0.0398	0.0125	3.1680	0.0041
ecm_{t-1}	-0.6167	0.0745	-8.2778	0.0000

SOUTH AFRICA

Table 117: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.9195	0.0002	---	---
LNGDPC	-1.3956	0.5771	-5.0295	0.0001
LNLIFEXP	-2.5861	0.1025	-4.0817	0.0014
GM	-2.3875	0.1501	-6.1215	0.0000
CM	-4.6273	0.0006	---	---
LNNBILA	-0.9855	0.7364	-4.9675	0.0011
LNHC	-1.1465	0.6901	-2.4009	0.1467***
UNEMP	-2.4354	0.1453	-3.4432	0.0222

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 118: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-6.3252	-5.7860	31.3894***

*** Lag selection is based on the minimum value of AIC.

Table 119: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	-1.3239	0.0017	-12.9142	0.5418	-0.6488	0.0621
$LNGDPC^2$	---	---	-1.1975	0.4578	---	---
$LNGDPC^3$	---	---	---	---	---	---
GM	0.0051	0.0002	0.0049	0.0055	0.0054	0.0004
CM	0.0099	0.0018	0.0096	0.0060	0.0060	0.0284
LNNBILA	0.0710	0.0009	0.0833	0.0093	0.0492	0.0127
LNLIFEXP	-0.4845	0.0067	-0.2408	0.6974	-4.2420	0.0387
UNEMP	---	---	---	---	0.0066	0.0572
	R^2 = 0.9812 Adjusted R^2 = 0.9499 AIC = -6.3252 F-Statistics = 31.3894 Prob (F-Stats) = 0.0002		R^2 = 0.9824 Adjusted R^2 = 0.9439 AIC = -6.2766 F-Statistics = 25.5128 Prob (F-Stats) = 0.0011		R^2 = 0.9930 Adjusted R^2 = 0.9723 AIC = -7.0876 F-Statistics = 47.8661 Prob (F-Stats) = 0.00098	

Table 120: Error-correction corresponding to ARDL (1, 0, 0, 0, 0, 0)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-0.6488	0.2526	-2.5685	0.0621
DCM	0.0060	0.0018	3.3560	0.0284
DGM	-0.0054	0.0004	-10.8885	0.0004
DLNNBILA	-0.0492	0.0114	-4.2927	0.0127
DUNEMP	0.0064	0.0024	-2.6755	0.0555
DLNLIFEXP	-4.2420	1.399	-3.0320	0.0387
ecm_{t-1}	-0.4192	0.0265	-15.8188	0.0000

TOGO

Table 121: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.5743	0.0007	---	---
LNGDPC	-2.5750	0.1047	-8.2884	0.0000
LNLIFEXP	-4.4356	0.0008	---	---
GM	-2.0573	0.2624	-5.4668	0.0000
CM	-5.1769	0.0001	---	----
LNNBILA	-4.4110	0.0009	---	---
LNHC	-2.0971	0.2467	-1.4983	0.5263***
UNEMP	-2.4323	0.1454	-7.1713	0.0000

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 122: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-3.4005	-2.8246	7.1102***

*** Lag selection is based on the minimum value of AIC.

Table 123: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.0874	0.3454	1.8465	0.7752
$LNGDPC^2$	---	---	1.4573	0.7768
$LNGDPC^3$	---	---	-0.8408	0.7782
GM	-0.0025	0.0471	-0.0025	0.0854
CM	0.0168	0.0481	-0.0025	0.0854
LNNBILA	0.0294	0.0503	0.0282	0.1156
LNLIFEXP	-9.8420	0.0012	-9.9590	0.0025
UNEMP	---	---	---	---
	R^2 = 0.8390 Adjusted R^2 = 0.7210 AIC = -3.4005 F-Statistics = 7.1102 Prob (F-Stats) = 0.0003		R^2 = 0.8409 Adjusted R^2 = 0.7819 AIC = -3.2642 F-Statistics = 5.2880 Prob (F-Stats) = 0.0025	

Table 124: Error-correction corresponding to ARDL (1, 0, 0, 0, 0, 0, 0)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-1.6753	5.7325	-0.2922	0.7744
DCM	-0.0034	0.0091	-0.3756	0.7128
DGM	-0.0020	0.0010	-1.8951	0.0789
DLNNBILA	-0.0003	0.0157	-0.0227	0.9821
DUNEMP	-9.8653	2.5553	-3.8607	0.0017
DLNLIFEXP	-2.5469	0.8194	-3.1081	0.0077
ecm_{t-1}	-0.3930	0.0580	-6.7758	0.0001

ZAMBIA

Table 125: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.9195	0.0002	---	---
LNGDPC	-1.4812	0.5348	-5.7531	0.0000
LNLIFEXP	-2.7827	0.0680	---	---
GM	-1.5762	0.4871	-8.5932	0.0000
CM	-0.9727	0.7537	-6.7563	0.0000
LNNBILA	-2.3304	0.1687	-6.7463	0.0000
LNHC	-1.7179	0.4162	-2.3370	0.1647***
UNEMP	-3.6405	0.0148	---	---

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 126: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-2.0383	-1.8938	1.8933
2	-2.4739	-1.9988	4.8719
3	-3.8858	-2.9431	6.4462
4	-4.9007	-3.5560	13.6062***

*** Lag selection is based on the minimum value of AIC.

Table 127: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.3432	0.0758	-6.0194	0.1402
$LNGDPC^2$	---	---	8.3126	0.1524
$LNGDPC^3$	---	---	-0.3711	0.1648
GM	0.0077	0.0179	0.0021	0.0453
CM	-0.0156	0.0804	-0.0071	0.0937
LNNBILA	0.0384	0.2277	0.0094	0.3265
LNLIFEXP	-3.0693	0.0225	-4.2439	0.0007
UNEMP	---	---	---	---
	R^2 = 0.7900 Adjusted R^2 = 0.6670 AIC = -4.8858 F-Statistics = 11.6062 Prob (F-Stats) = 0.0509		R^2 = 0.6419 Adjusted R^2 = 0.5092 AIC = -4.0400 F-Statistics = 9.8401 Prob (F-Stats) = 0.0005	

Table 128: Error-correction corresponding to ARDL (1)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	-11.2444	3.9996	-2.8113	0.0169
DCM	0.0087	0.0084	1.0424	0.3196
DGM	-0.0002	0.0013	-0.1717	0.8668
DGM_{t-1}	0.0054	0.0020	2.6101	0.0243
DLNNBILA	-0.0182	0.0168	-1.0788	0.3038
DLNLIFEXP	-2.5653	75.1951	-3.4147	0.0058
ecm_{t-1}	-0.5611	0.1325	-4.2347	0.0031

ZIMBABWE

Table 129: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	3.6476	0.0081	---	---
LNGDPC	0.0596	0.9592	-0.0448	0.9493***
LNLIFEXP	0.8443	0.9939	-2.0573	0.2624
GM	-1.4229	0.5641	-8.7194	0.0000
CM	-3.2545	0.0225	---	---
LNNBILA	-1.6440	0.4484	-3.7345	0.0101
LNHC	-1.6227	0.4637	-1.4337	0.5584***
UNEMP	-0.7654	0.8083	-3.6791	0.0131

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

GHANA

Table 130: Unit Root test

Variables	ADF test at level	Probability Value	ADF test at First Difference	Probability Value
LNGINI	-4.9830	0.0005	---	---
LNGDPC	-0.8775	0.7871	-3.0901	0.0340
LNLIFEXP	-5.2270	0.0001	---	---
GM	-2.3367	0.1647	-8.2563	0.0000
CM	-0.5628	0.8668	-5.9616	0.0000
LNNBILA	-0.2553	0.9222	-15.0705	0.0000
LNHC	-3.0252	0.0393	---	---
UNEMP	-2.2176	0.2062	-1.6316	0.4469***

*** Variables are not integrated at *I(0)* or *I(1). We therefore drop such variables*

Table 131: Lag length selection and ARDL F-statistics

Order of lags	AIC	SIC	F-test Statistics
1	-3.6549	-3.0535	8.9260
2	-4.3729	-3.4940	13.3253***

*** Lag selection is based on the minimum value of AIC.

Table 132: Long run Coefficient using ARDL Method
Dependent Variables = DLNGINI

Variables	Coefficient	Prob-Value	Coefficient	Prob-Value
LNGDPC	0.1976	0.1175	0.7543	0.0001
$LNGDPC^2$	---	---	-0.1027	0.0001
$LNGDPC^3$	---	---	0.0046	0.0001
GM	-0.0018	0.0246	-0.0005	0.1229
CM	0.0212	0.0119	-0.0006	0.1000
LNNBILA	0.0214	0.0021	---	---
LNLIFEXP	-11.7341	0.0000	0.0309	0.0397
LNHC	-10.5327	0.0000	---	---
	R^2 = 0.9523 Adjusted R^2 = 0.8808 AIC = -4.3729 F-Statistics = 13.3253 Prob (F-Stats) = 0.0002		R^2 = 0.9875 Adjusted R^2 = 0.8975 AIC = -17.9839 F-Statistics = 14.4532 Prob (F-Stats) = 0.0003	

Table 132: Error-correction corresponding to ARDL (2, 1, 2, 1, 1, 2, 2)
Dependent Variable = DLNGINI

Variables	Coefficient	Std Error	T-statistics	P-value
DLNGDPC	20.3376	9.2496	2.1987	0.0928
DCM	0.0116	0.0071	1.6227	0.1800
DGM	-0.0028	0.0009	-2.9281	0.0429
DLNHC	-12.9232	4.4091	-2.9310	0.0428
DLNNBILA	0.0163	0.2574	1.3198	0.2574
DLNLIFEXP	-14.5221	2.1218	-2.7727	0.0502
ecm_{t-1}	-0.7910	0.0720	-10.9861	0.0004

Table 133: Critical value Bounds for the F-statistics
Testing for the existence of a long-run relationship

	90%		95%		99%	
k	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
0	9.84	9.84	11.64	13.36	15.73	15.73
1	5.59	6.26	7.30	7.46	8.74	9.63
2	4.19	5.06	5.85	5.49	6.34	7.52
3	3.47	4.47	5.07	4.52	5.17	6.36
4	3.03	4.06	4.57	3.89	4.40	5.72
5	2.75	3.79	4.25	3.47	3.93	5.23
6	2.53	3.59	4.00	3.19	3.60	4.90
7	2.38	3.45	3.83	2.98	3.34	4.63
8	2.26	3.34	3.68	2.82	3.15	4.43
9	2.16	3.24	3.56	2.67	2.97	4.24
10	2.07	3.16	2.33	2.56	2.84	4.10

Source: Pesaran, M. H., Shin, Y. and Smith, R. J., (2001),