

**TITLE: ASSESSING THE IMPACT OF COMMODITY PRICES AND ECONOMIC GROWTH FOR SELECTED AFRICAN COUNTRIES: PANEL DATA ANALYSIS**

**BY**

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**Abstract**

Deaton (1993) describes the African economy as one that exports primary commodities more than finished goods. Most studies describe such economic system as hope like Deaton (1993) and as curse according to Collier and Goderis (2008) for the African countries. The main purpose of the paper is to investigate the effect of commodity prices on African economic growth. In order to contribute to the existing literature, the paper tested empirically using panel data approach by employing pooled regression analysis, fixed and random effect model and also tested the theoretical relationship between commodity prices and economic growth. The study used the unbalanced dataset for 2001-2015 periods, for 16 selected African countries. The study computed commodity price index using the information from world integrated solution 2015 and IMF in order to take care of the fact that African countries export different commodity goods.

The result shows that primary commodity prices exhibit inelastic positive effects on economic growth for selected African countries which are in line with studies conducted by (Collier and Goderis, 2007 and Deaton, 2003). However, any commodity price increase brings economic growth. The policy implication for the African countries is that they are exposed to the decrease in primary commodity prices and also their inability to cope when commodity prices are low; therefore it is recommended that African countries find a way to diversify their economy.

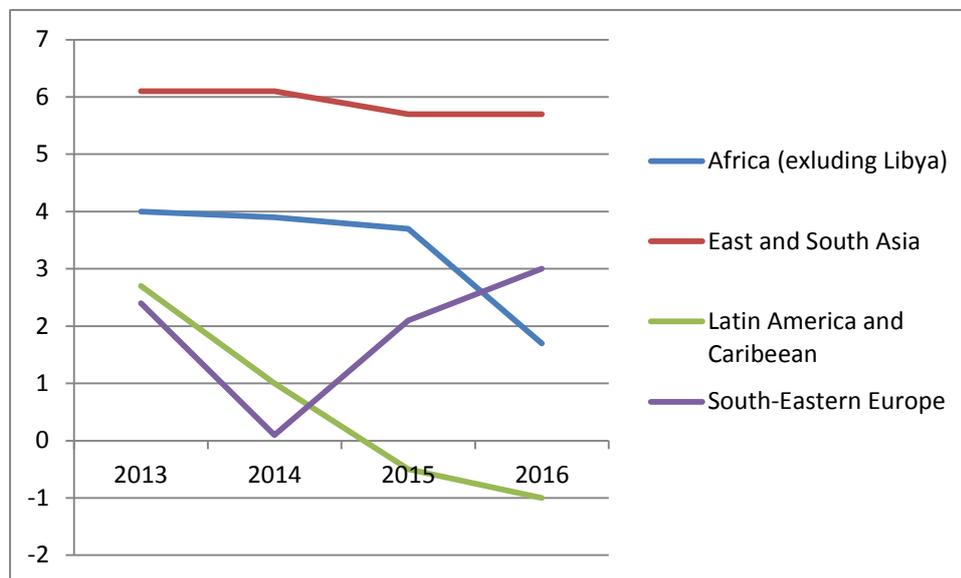
**1. Introduction**

The importance of primary commodities on African economic growth is high due to the dependence of African economies on the export of primary commodities for their foreign exchange earnings and its high contribution to the gross domestic products (GDP). In general, studies on the structural models of commodity prices generally agreed that the

world industrial activities in the united states of America exchange rate are the major causes of commodity prices movements (Lalonde, Zhu, & Demers, 2003). Borensztein & Reinhart (1994) argues that oil price shocks are an important factor in the adjustment of non-oil commodity prices.

Unstable commodity prices generally have negative effects on the current account balance and economic growth for primary commodity dependence countries. The reason is too much dependent on global commodity prices.

Figure 1.1. Economic growth for Africa and emerging and developing countries, 2013–2016



Source: The author using UNDESA (2016) and EIU (2016) data

Figure 1.1 shows that African economic growth declined as low as 1.7 percent in 2016 from 3.7 percent in 2015, which is below both the global economic growth rate of 2.3 percent and some other regions.

The critical issue to consider is the level of income generated from commodity export guarantee economic growth in African countries. Therefore, the purpose of this paper is to determine if commodity prices instability has an impact on African economic growth and the level commodity prices change determines the level of African economic growth. Irrespective of the important role commodity prices play in economic growth for the primary commodity export-dependent countries like Africa, the impact on African economy are under studied.

## 2. Literature review

## 2.1. Empirical literature

The determinants of economic growth are the related variables that have an impact on the rate of growth in an economy. Economic growth rate varies among nations; the explanation behind these varieties is an important issue for policymakers. There are many studies conducted for developed and developing countries to ascertain the relationship between commodity prices and economic growth. Many of the studies have investigated the relationship between commodity prices, and economic growth in respect to trade. Most of the studies found Commodity prices to have a long-run positive effect on economic growth, especially for commodity-dependent economies (see Sala-i-Martin et al., 2004; Alexeev and Conrad, 2009). Other studies found a negative impact on commodity prices fluctuations on economic growth (see Gylfason, 2001; Sachs and Warner, 2001; Berk and Yetkiner, 2014). (D. V. Cavalcanti, Tiago, Mohaddes, & Raissi, 2015) investigated the effects of commodity price booms and terms of trade volatility on GDP per capital growth using GMM dynamic panel and augmented pooled mean group (PMG) estimator for the period 1970 to 2007, and found a negative effects of commodity terms of trade volatility on GDP per capital growth, and that commodity terms of trade growth increase real output per capital.

Artelaris, Arvanitidis, & Petrakos (2007) found commodity prices to significantly impact economic growth for the 24 western and central African countries under study and confirmed the benefit of commodity prices increase from 1999 to 2015, which net oil exported countries recorded positive rate of economic growth, while net importing countries benefited from increasing their major non-oil commodity export prices. However, the majority of the excess reserves of commercial banks bring challenges in financial sector developments and the effectiveness of monetary policy in many western and central African countries.

Olakojo (2015) investigates the effect of primary commodity prices on the long-run growth for 24 primary commodity-based African economies using commodity types and level of diversification in the primary commodity. The study used Pooled Mean Group (PMG) heterogeneous panel data (accounting for cross-country heterogeneity and cross-sectional dependence) was estimated, while the robustness of PMG was confirmed using log-likelihood chi-square ratio test for the period 1990 to 2014, and the result shows inelastic significant positive effect of primary commodity export prices on economic growth of selected African countries in the long run.

Rosine (2013) used VAR methodology to investigate the effect of commodity price fluctuation on fiscal, and output of CEMAC countries for the period 1990 to 2010, and found that raw materials price fluctuation leads to the low government and producers revenue.

Alley, Asekomeh, Mobolaji, & Adeniran (2014) investigated the impact of oil price shocks on the Nigerian economy using data for the period 1981 to 2012 by the use of general method of moment (GMM) methodology and found that oil price shocks significantly affects economic growth, while oil price itself significantly affects growth. The result confirms the earlier conventional wisdom that oil price increase is beneficial to the oil-exporting countries.

Nwoba, Nwonu, & Agbaeze (2017) investigated the impact of fallen oil prices on the Nigerian economy using simple regression analysis, Pearson product-moment correlation, and chi-square. The result found that the fallen oil price has a significant effect on the economy of Nigeria and recommended the diversification of the economy to meet the challenges faced by the economy. Jayaraman & Lau (2011) found that the oil boom and the commodity prices increase including the increase in oil prices brought substantial economic growth to a new guinea. (Mgbame, Donwa, & Onyeokweni, 2015) examines the conceptual impact of oil price volatility on Nigerian economic growth using explanatory methodology, and found positive relationship between oil price volatility and Nigerian economic growth, which shows that the price of oil controls the level of government expenditure, rate of inflation, and level of unemployment, which are the main determinants of Nigerian economic growth.

(Gruss, 2014) studied what the commodity price cycle may mean for output growth in Latin America and the Caribbean. The result shows that growth in the years ahead for the average commodity exporter in the region could be highly lower than during the commodity boom, even if commodity prices were to remain stable. The results warn against any effort to eliminate the current economic slowdown with the demand-side stimulus and underscore the need for ambitious structural reforms to secure strong growth over the medium term.

(Saggu & Anukoonwattaka, 2015) found that low levels of product diversification and high reliance of some Asia-Pacific LDCs and LLDCs on a few commodities can lead to unpredicted revenue streams, and policies are required to stabilize incomes. High-levels of commodity-export concentration also leaves export revenues and economies highly vulnerable to exogenous shocks, such as volatile commodity prices, and sharp changes in demand and supply. As the demand for commodities tends to be highly inelastic, the recent commodity price decline is likely to translate into lower revenues and downward revisions in economic growth across net commodity exporters and economies where export revenues account for a larger share of GDP. The study by (Hachula & Hoffmann, 2015) on the output effects of commodity price vitality using structural vector autoregression with multivariate

GARCH in mean errors found a significant negative impact of commodity price volatility on real output for the exporting countries in the sample.

Arezki & Gylfason (2011) investigated the impact of commodity price volatility on the economic growth of 158 countries covering 1970 to 2007. The study found that commodity price volatility leads to a significant increase in non-resource GDP growth in democratic countries and a non-significant increase in an autocratic regime.

Kurihara (2015) found that oil price increase brings positive economic growth in the United States, European Union, and Japan. The VAR result found the short-term effect of about one year. The study was conducted on oil prices and economic growth in developed countries. Idrisov, Kazakova, & Polbin (2015) investigated the impact of global oil prices on Russia's economic growth and its growth rate in terms of output and found that based on classical models; a steady rise in oil prices cannot influence the long-term economic growth rate and only predetermines short term transitional trends from long-term equilibrium to another. Most studies like (Alexeev & Conrad, 2009; Smith, 2015) questions the existence of resource curse as advocated by some studies. The argued that the resource boom is associated with positive economic growth.

Connolly & Orsmond (2011) stated that the increase in world commodity prices during the 2000s has made mining more profitable and encouraged a shift in labor, investment and materials into the mining industry. While the increase in global commodity prices has been broad and highlighted that there were mainly large increases in the price of steelmaking commodities such as cooking coal and iron ore. However, over a decade commodity exports have, on average, contributed 55 percent of total export values and 11 percent of Australian GDP. Rayner & Bishop (2013) studied the sectoral impact of commodity prices on the Australian economy using input-output tables to quantify the links between domestic industries. They conclude that the mining boom has a positive impact on sectors that supply inputs to the resources, such as construction, and manufacturing sector. However, the output of industries not directly related to the resource sector has declined due to a stronger currency, and increased competition for factors of production.

Arbatli<sup>1</sup> and Vasishtha (2012) found that revisions to growth forecasts for emerging Asia play an important role in explaining movements in the real prices of industrial metals. In addition, the REER of the U.S. dollar is an important determinant of industrial commodity prices. For crude oil, growth forecast revisions for the U.S. and the real interest rate play a significant role in explaining real prices. Furthermore, growth surprises, in general, fall short

of explaining the fast run-up in most commodity prices during 2006-2008, and the magnitude of the collapse in prices during the recent global financial crisis.

## **2.2. Theoretical literature**

Growth has been a central component of economic thought at least since Adam Smith. The modern investigation of growth using formal models started just around the middle of the 20th century (Boianovsky & Hoover, 2009). The issue of the relationship between commodity prices and economic growth has been in expanding debate among researchers and scholars. However, there was no known acceptable model for the study of economic growth and development, which are attributed to the absence of any generally accepted economic growth theory by researchers (Easterly, 2001). Moreover, the main theories used in the literature are the neoclassical theory formalized by (Solow, 1956), which emphasizes most on the significance of capital allocation and the theory of endogenous growth theory supported by (Lucas, 1988; Romer, 1986, 1990), which are centred on human capital and growth limits. Besides these theories, there are other essential issue on economic growth given by the new economic geography. They pay serious attention to the importance of improvement which described the critical part of noneconomic elements that contribute to the economic growth. Most studies support such a notion, for example, capital aggregation, political frameworks, social spending, population growth, and land allocation and distribution as factors that determine economic growth.

## **3. Conceptual literature on commodity prices**

Over the years, commodity prices have experienced positive and negative trend and highly volatile (Alquist & Coibion, 2013; T. Cavalcanti, Mohaddes, & Raissi, 2012). The volatility of the commodity prices can be attributed to the global developmental economic activity especially in emerging economies (Dwyer, Gardner, & Williams, 2011). Chen, Jackson, Kim, & Resiandini (2014) argues that the major reason is the United States of America nominal exchange rate, while (Arora & Tanner, 2013) argues that it is as a result of the monetary policy easing and (Etienne, Irwin, & Garcia, 2018) suggested that the reason is as a result of speculation. Generally, commodity prices have an impact on countries inflation, food and energy security, economic and political stability of countries (Gouel, 2013; Kirwan, Ilbery, Maye, & Carey, 2013).

Over a long period, commodity prices became a vital area of study by scholars and challenges to policymakers. (Grynberg & Newton, 2007) argues that commodity prices have a huge impact on less privileged citizens of the primary commodity dependence countries.

#### 4. Methodology

The study relied on the theoretical and empirical literature on economic growth discussed earlier, where commodity prices are included as one of the main determinants and factors of production. It contributed in a way of an added input or as a technological limitation that determines the production process (Kataryniuk & Martínez-Martín, 2018).

After reviewing existing literature, the study modified neoclassical model adopted by (Crepin, 2016), in a way of incorporating commodity prices and other variables used in the study and also excluded some variables. The decision was due to nonavailability of data and the relevance of variables to the study.

The study assumes the empirical model stated in the form of:

$$GDP_{it} = b_1 + b_{it}CP_{it} + b_{2it}HU_{it} + \sum_{i=0}^k b_{it}Y_{it} + \varepsilon_{it} \quad (4.1)$$

Where:

GDP= the dependent variable which estimates the level of economic growth (gross domestic product).

$CP_{it}$ = the commodity prices.

$HU_{it}$  = the human capital.

$Y_{it}$  = other sets of independent variables that are included in the econometric model. The gross domestic product (dependent variable) is the measure of the GDP at 2010 constant price. The other important macroeconomic variables used in the study include gross fixed capital formation (GFCF), trade openness (TO), total population (POP), and inflation (INF). The error term  $\varepsilon$  represents all the classical assumptions and the bs for the coefficients that are to be estimated.

##### 4.1. Method of estimation

Panel data generally is the combination of the time-series and cross-sectional data. It contains a cross-sectional data showed by a subscript (i) and a time period arrangement measurement, showed by a subscript (t) (Gujarati & Porter, 2009; Hsiao, 2007). “ It is a database in which the behavior of the entities are observed over time” (Torres-Reyna, 2007). Panel data are most valuable when the result of the variable relies upon independent variables, which are not observable but are rather correspondent with the observed

variables. In the event that such missed variables are steady after some time, panel data techniques permit to reliably gauge the impact of the watched observed variables (Schmidheiny, 2014).

A panel data can be balanced or unbalanced panel. The balanced panel data is where each firm or individual has the same number of observation, while the unbalanced panel data is where each entity has a different number of observations (Gujarati & Porter, 2009; wooldridge, 2013). The study utilized unbalanced data due to the missing data for most of the countries under study. The study estimated a pooled regression model, fixed and random effect model.

### POOLED REGRESSION MODEL

The pooled regression model is a situation where every country is assumed to share the same intercept. The model assumes that every country has identical coefficients like the slope and intercepts terms.

The model for the pooled regression model can be stated as:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \epsilon_{it} \quad (4.2)$$

Equation 3.1 shows the pooled regression model, where every country are believed to share the same intercept ( $\beta_0$ ) and the slope of the coefficients ( $\beta_1$  to  $\beta_6$ ),  $i$  represent the 16 cross-sectional countries in the dataset,  $t= 15$  years of the time period.  $Y_{it}$  is the natural log of GDP and  $X_{1it}$  to  $X_{6it}$  is the CP, HU, GFCF, TO, POP and INF respectively, while  $\epsilon_{it}$  represents the random error terms whose mean value is zero, which are uncorrelated across different countries with a constant variance.

Therefore, equation 3.1 is transformed into:

$$\log GDP_{it} = \beta_0 + \beta_1 CP_{it} + \beta_2 HU_{it} + \beta_3 GFCF_{it} + \beta_4 TO_{it} + \beta_5 POP_{it} + \beta_6 INF_{it} + \epsilon_{it} \quad (4.3)$$

Equation 3.2 assumes that every country is identical in the slope of the coefficients and intercepts and that all countries in the sample have the same response to the changes in the explanatory variables. While in reality, the countries in the dataset are heterogeneous and may differ from the others, which means that each country has its own intercept term that captures the heterogeneous effects that might make the pooled regression model inappropriate.

## FIXED EFFECTS MODEL

In panel data analysis, the fixed-effect model is used to capture the omitted heterogeneity. Fixed effect model explains the relationship between the control and the dependable variables in an entity, where every entity has its own personal behavior that cannot be controlled (Torres-Reyna, 2007). In the fixed-effect model, the effect of the dependable and control variables are taking care of, which was the reason for assuming that the correlation between the entities error term and control variables exist (Torres-Reyna, 2007). Generally, the fixed-effect model tries to eliminate the impact of time-invariant in order to see the main impact of the control variables on the dependable variables. Fixed effect model takes care of the heterogeneity effect for each country by estimating each countries intercept.

In the process of developing the model, it is assumed that the relationship between the endogenous and exogenous variables are equal among all countries as in (Crepin, 2016). In this case, there are 16 countries observed over the period of 16 years using six variables.

The fixed effect model is written as:

$$Y_{it} = \beta_{0i} + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \epsilon_{it} \quad (4.4)$$

The above equation relax the assumption that every country are the same, which means that  $\beta_{0i}$  captures individual countries differences for every country (i), that is the country-specific heterogeneity effect, where the assumption is that the slope of the parameters is constant for each country and at all time. The slopes of the parameters are interpreted as identical average responses for all countries and time.

In adopting the model, the study adopted the equation:

$$GDP_{it} = \beta_{0i} + \beta_1 CP_{it} + \beta_2 HU_{it} + \beta_3 GFCE_{it} + \beta_4 PG_{it} + \beta_5 TO_{it} + \beta_6 FDI_{it} + \epsilon_{it} \quad (4.5)$$

## RANDOM EFFECT MODEL

Random effect model is a type of panel data where the unobserved effect is assumed to be uncorrelated with the independent variables for each period of time (wooldridge, 2013).

In a random effect model, the variation across entities is taken to be random and uncorrelated with the dependent variable or independent variables as included in the model. The random effect model is used when the differences across entities have some influence on the exogenous variable. The random effect model is assumed to randomly select from

the population. The main advantage of the random effect model is that time-invariant variables can be included in the model, unlike the in the fixed-effect model, where such variables are absorbed by the intercept.

The random effect model takes the form of:

$$Y_{it} = \bar{\beta}_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + (\mu_i + \epsilon_{it}) \quad (4.6)$$

The model assumes that the entities error term was not correlated with the explanatory variables. The major problem with the model is that most variables may not be available which leads to omitted variable bias. The intercept terms in equation 3.5 are seen as random effects. It is assumed that random effect captures the individual differences by the intercept ( $\bar{\beta}_0 + \mu_i$ ), but accept that the individual countries t were randomly selected. Therefore, the intercept term comprises of the population average  $\bar{\beta}_0$  and the random individual differences  $\mu_i$ . The population average is grouped together with the random regression error  $\epsilon_{it}$ . The error terms are randomly distributed with a mean value of zero that are not uncorrelated across individual countries that have a constant variance

The model is in the form:

$$GDP_{it} = \bar{\beta}_0 + \beta_1 CP_{it} + \beta_2 HU_{it} + \beta_3 GFCE_{it} + \beta_4 TO_{it} + \beta_5 POP_{it} + \beta_6 INF_{it} + (\mu_i + \epsilon_{it}) \quad (4.7)$$

J. A. Hausman & Ruud, (1987) will be used to determine which of the fixed and random effect should be accepted. These are usually applied in econometrics cases that require specification. According to (Torres-Reyna, 2007) in testing for Hausman test:

$H_0$ : the model is random effect.

$H_1$ : The model is fixed effect.

Generally, the Hausman test checks if the unique errors  $u_i$  are correlated with the independent variables.

## 4.2. Data issues

The study used annualized data set covering the period between 2001 and 2015 For 16 Selected African Countries. The Countries under reviews are Algeria, Burkina Faso, Burundi, Cameroon, Egypt, Ghana, Kenya, Malawi, Mauritius, Niger, Nigeria, Senegal, Seychelles, South Africa, Tunisia, and Uganda. The countries were selected based on the availability of data. The data used in the study includes data for other important macroeconomic variables

which are GDP as the dependent variable, which estimates the level of gross domestic product; CP represents the commodity prices, human capital (HU), gross fixed capital formation (GFCF), summation of total export and import was used as a measure of trade openness (TO), total population (POP) and inflation (INF).

The variables description that is included in the empirical model is explained below.

#### THE GROSS DOMESTIC PRODUCT (GDP)

This is the measure of all the finished goods in monetary terms within the boundaries of a particular country for a particular year. GDP (constant 2010 US\$) are utilized and are published by the world development indicator (WDI). The GDP is generally accepted as a proxy for economic growth because it measures the total output the economy produced as well as services that took place in the economy.

#### COMMODITY PRICES (CP)

Commodities individual units are mainly interchangeable and are treated as the same in the market irrespective of the producer. The commodity-exporting nation has no or minimum control over its commodity prices and is therefore determined by the world international market through the forces of demand and supply. This the reason (Hofstrand, 2007) describes the commodity export nations as price takers.

The existing literature on the commodity prices utilized the specific commodity prices, the indices of the terms of trade or countries specific of the indices of the specific commodity prices like in (Cashin, Céspedes, & Sahay, 2004). Bodart, Candelon, & Carpentier (2012) utilized individual commodity prices, while (Ricci, Lee, & Milesi-Ferretti, 2008). Dehn (2000) concludes that both methods do not give satisfactory result due to the inability of any individual country specializing in the production of any particular commodity. The changes in the commodity prices are not shown in the price of one particular commodity. On the other hand, terms of trade indices assumed to contain excess information. Particularly, terms of trade refer to “the relative price of exports in terms of imports” (Obstfeld and Rosoff 1996). This means that the total amount of goods imported that a country can buy in terms of a unit of exported goods. The terms of trade indices show how different non-commodity and non-exported commodity prices influence in addition to the general information about commodity prices. On that note, terms of trade indices are not regarded as a good measure of commodity prices. Considering the three ways of measuring commodity prices as explained, country specific commodity prices indices are assumed to be the best and most acceptable

(Dehn 2000). This measure of commodity prices has the merit of computing commodity prices indices for each country using available data.

The study utilized country-specific commodity prices indices by constructing each countries commodity price index separately using their major commodity export.

#### HUMAN CAPITAL (HU)

Human capital (HU) is one the most important determinant of economic growth as used in the literature like (Baro & Sala-i-Martin, 1995). This generally means the worker's acquisition of skills and experience by the means of education and training. Bassanini & Scarpetta (2002) argues that human capital is subject to the law of diminishing returns which allows more trained and skilled workers enjoy some level of income in the long run. Most studies like (Baro & Sala-i-Martin, 1995; Blanchard & Gali, 2007; Brunetti, Kisunko, & Weder, 1998) measured the strength of human capital using proxies related to education like school enrolment rates, government spending on education. According to (Kwon, 2009), this method of measurement has the disadvantage of difficulty in measuring the performance of a student without participating in any production activities. Nehru, Swanson, & Dubey (1993) measures the relationship between human capital and the total number of years in schooling and was unable to show the relationship because educational attainment is part of normal school education. Romer (1990) argues that using the ratio between skilled adults and total adults may be appropriate in measuring the rate of human capital in any economy. The study utilized the new approach to human capital measurement, by using the human capital index (HCI) published by the United Nations development program (UNDP) as a proxy for human capital. The index combined health, knowledge, and standard of living together with other variables such as life expectancy at birth, adult literacy rates, gross enrolment ratio and GDP per capital. Kwon (2009) suggested that this type of measurement are of more quality as regards to the economic perspective.

#### GROSS FIXED CAPITAL FORMATION (GFCF)

Gross fixed capital formation (GFCF) calculates the total value of the purchasing of new or existing fixed assets by the government, household or business. Gross fixed capital formation is used to measure the importance of capital in the model. It comprises four different kinds of capital goods (machinery and equipment, furniture, and land/ structure). The GFCF is proxy for capital in the model.

#### TRADE OPENNESS (TO)

Trade openness (TO) is one of the key variables used in economic growth literature as the main determinants of the performance of the economy (Artelaris, Arvanitidis, & Petrakos, 2007a). The trade openness affects economic growth in the area of technology transfer and sharing of knowledge. Trade openness is usually measured by the ratio of exports to GDP like (Dollar & Kraay, 2000), while some other studies used the summation of the ratio of exports and imports to GDP as used in this study. Alcalá & Ciccone (2003) argues that trade openness in many ways. Therefore it is a complicated task to find any generally accepted measure of trade openness. Some studies measured trade openness by trade intensity, tariff and non-tariff barriers.

Since the 1990s, the international monetary fund and world bank regarded trade openness as an important determinant of the level of a countries economic growth (Dao, 2014). Earlier studies considered exports as a measure of trade openness while neglecting imports. The theory of comparative advantage argues that trade causes more reasonable use of local resources, by the way, importing goods that are more expensive to produce locally (Yanikkaya, 2003). Therefore, both imports and exports are important in the measure of trade openness. The trade openness captures the policies that different countries took in relation to other countries. The data for export and import of the 16 selected African countries were extracted from the world development indicator (WDI) published by the World Bank.

## POPULATION

The total population is used in most literature in determining the level of economic growth in a country. The data was extracted from world development indicator (WDI) published by the World Bank.

## INFLATION (INF)

Economic policies and macroeconomic conditions have also attracted much attention as determinants of economic performance . This is because they can set the framework within which economic growth takes place (Baro & Sala-i-Martin, 1995). Economic policies can influence several aspects of an economy through investment in human capital and infrastructure, improvement of political and legal institutions . In addition, a stable macroeconomic environment may favor growth through the reduction of uncertainty, whereas macroeconomic instability may have a negative impact on growth through its effects on productivity and investment". "Several macroeconomic factors with impact on growth identified in the literature include inflation, fiscal policy, budget deficits, and tax

burdens (Fischer, 1993). The used the consumer price index for the selected African countries as a proxy for inflation.

## 5. Result presentation and analysis

This part of the study shows the result of the descriptive analysis of the variables considered in the empirical estimation and regression analysis. The study used the levin-lin-chi (LLC), the LM-Pesaran-shin (IPS) and breitiungs are used to determine the properties of the panel data sets as shown in table 5.1. Table 5.1 explains the result of the panel unit root test at both level and individual intercept. The result shows that gross domestic product (GDP), human capital (HU), gross fixed capital formation (GFCF), Trade Openness (TO) are non-stationary at 5 percent level based on majority result of different methods shown in table 5.1, while commodity prices (CP), total population (POP) and inflation (INF) are stationary at 5 percent level based on majority results presented in table 5.1.

**Table 5.1: PANE UNIT ROOT TEST RESULT USING A MODEL FOR INDIVIDUAL INTERCEPT ONLY**

NAME OF VARIABLE	LLC t statistic	IPS	ADF-Fisher chi-square	PP-fisher Chi-square	Lag length (SIC)
LNGDP	-1.60788 (0.0539)	3.51632 (0.9998)	25.8149 (0.7717)	28.0421 (0.6673)	0-2
LNCP	-3.02655 (0.0012)	-2.06512 (0.0195)	44.6886 (0.0674)	49.9478 (0.0236)	0-1
LNHU	-6.25998 (0.000)	-0.36418 (0.3579)	40.6651 (0.1400)	39.4040 (0.1225)	0-2
LNGFCF	-2.52389 (0.0058)	-0.23162 (0.0058)	32.3226 (0.4508)	29.5167 (0.5928)	0-2
LNTO	-2.08143 (0.0187)	-0.47189 (0.3185)	33.0118 (0.4175)	31.9144 (0.4710)	0-1
LNPOP	-2.65944 (0.0039)	1.90337 (0.9715)	46.9972 (0.0249)	56.5676 (0.0024)	0-2

LNINF	-7.05327 (0.0000)	-4.51850 (0.0000)	76.9946 (0.0000)	81.8174 (0.0000)	0-1

Source: Generated by the researcher using Eviews result

**Table 5.2: PANE UNIT ROOT TEST RESULT FOR SELECTED AFRICAN COUNTRIES USING A MODEL FOR 1<sup>ST</sup> DIFFERENCE AND INDIVIDUAL INTERCEPT**

NAME OF VARIABLE	LLC t statistic	IPS	ADF-Fisher chi-square	PP-fisher Chi-square	Lag length (SIC)
LNGDP	-8.51535 (0.0000)	-7.34240 (0.0000)	111.142 (0.0000)	100.750 (0.0000)	0-2
LNCP	-13.8228 (0.0000)	9.54471 (0.0000)	141.804 (0.0000)	161.198 (0.0000)	0-1
LNHU	0.40746 (0.6582)	-0.88252 (0.1887)	41.4378 (0.1226)	100.596 (0.0000)	0-2
LNGFCF	-7.11303 (0.0000)	-5.21838 (0.0000)	90.7741 (0.0000)	113.395 (0.0000)	0-2
LNT0	-11.8317 (0.0000)	-9.16757 (0.0000)	132.437 (0.0000)	159.431 (0.0000)	0-2
LNPOP	0.50496 (0.6932)	-3.08524 (0.0010)	89.0220 (0.0000)	49.2154 (0.0265)	0-2

SOURCE: Generated by the researcher using the Eviews result.

Table 5.2 shows the result of a panel unit root test for first difference and individual intercept. The result shows that all variables are stationary at first difference and individual intercept based on majority results of different methods.

Table 5.3 shows the result of the pool regression model, fixed and random effect model. The pool regression model states that the cross-sectional variance can be combined together to

produce the intercept. Due to the presence of serial correlation the lagged gross domestic product (GDP) was incorporated as one of the independent variables. The pool regression result indicates the there is positive relationship lagged GDP, CP, GFCF, TO, POP and GDP (economic growth), while there is a negative relationship between economic growth and human capital and inflation.

**Table 5.3: Pool regression model, fixed effect model and random effect model for the 16 selected African countries**

VARIABLE	POOL REGRESSION MODEL	FIXED EFFECT MODEL	RANDOM EFFECT MODEL
CONSTANT	-0.204223 (0.0033)	-3.404471 (0.0596)	5.138774 (0.0001)
LAGLNGDP	0.994529 (0.0000)	-	-
LNCP	3.344E-05 (0.9753)	0.032425 (0.0000)	0.033244 (0.0000)
LNHU	-0.002825 (0.8127)	0.098219 (0.5593)	0.827557 (0.0000)
LNGFCF	0.016815 (0.0046)	-0.024180 (0.3215)	-0.041636 (0.0867)
LNT0	0.025615 (0.0001)	-0.115225 (0.0002)	-0.120681 (0.0001)
LNPOP	0.013026 (0.0000)	1.667590 (0.0000)	1.191868 (0.0000)
LNINF	-0.002776 (0.1067)	-0.009447 (0.1360)	-0.010601 (0.0943)

Source: computed by the author using result generated from Eviews

The fixed-effect model assumes that there may be the existence of unobserved factors in the individual countries, which are important to be controlled; while random effect model assumes that the differences in countries are random. The result is presented in table 5.3. The result of the fixed effects model shows that commodity prices, trade openness and total population are significant at 5 percent. The result also indicates that commodity prices, human capital, and total population are positively related to economic growth, while gross

fixed capital formation, trade openness and inflation are negatively related to economic growth.

The result of the random effect model presented in table 5.3 indicates that commodity prices, human capital, trade openness, and total population are significant at 5 percent level. The result also shows that commodity prices, human capital, and total population are positively related to African economic growth, while trade openness, gross fixed capital formation, and inflation has a negative relationship with African economic growth.

**Table 5.4:  $R^2$ , F-stat and DW-stat result**

	<b>POOL REGRESSION MODEL</b>	<b>FIXDED MODEL</b>	<b>EFFECT MODEL</b>	<b>RANDOM MODEL</b>	<b>EFFECT MODEL</b>
$R^2$	0.999814	0.998453		0.872298	
F-stat	144169.8	5773.388		231.1068	
DW-stat	1.464040	0.413137		0.323765	

Source: compiled by the author using Eviews result

**Table 5.5: Hausman test result**

Test summary	Chi-square statistic
Cross section Random	55.324718 (0.0000)

Source: the author using the result generated from Eviews

The problem associated with pooled regression is the reason for using fixed and random effect model. (J. A. J. E. J. o. t. e. s. Hausman, 1978) try to show which among the fixed and random effect model, more especial when both have differennt results. The Hausman test is conducted with the null hypothesis being that the random effect model is appropriate and alternative hypothesis states that the fixed effect model is appropriate. Table 5.5 gives a summary of the Hausman test.

The chi-square statistics of 55.324718 are highly statistical with 0.0000 probabilities. The result shows that the null hypothesis is rejected and the conclusion is that individual effects are uncorrelated.

## 6. Conclusion and policy recommendations

This paper examines the impact of commodity prices on economic growth for selected African countries. The level of commodity prices effect is associated with the economic structures and the nature of diversification for African countries. The regression analysis shows that primary commodity prices have positive effects on the economic growth of selected African countries. Hence, the increase in prices of these commodities promotes economic growth. This is due to the low level of diversification (both in terms of economic diversification and primary commodity exports diversification) among many African economies resulting in limited ability to maneuver their ways in case of commodity prices crash. Some of the outcomes of this study are in line with some of the previous studies such (Collier & Goderis, 2007).

The policy lesson is that African countries may be vulnerable to primary commodity prices decrease and the ability to recover when there are unfavorable price changes may be slow. Hence, the study recommends African countries to, as a matter of urgency, intensify efforts at mobilizing domestic resources and diversify their economies. This is not only limited to diversifying the primary commodity export base but their production base as well. This will go a long way to minimize external shocks since domestic resources are more reliable and can be controlled than exogenous external resources

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