Exports and Economic Growth: New Evidence from Four Sub Saharan Countries

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Abstract
Purpose - *The paper aims at analysing the relationship between exports and economic growth (GDP), determining the causality between the two variables and to examine the contributing factor of exports on the economic growth in selected Sub-Saharan countries namely;* ***Zambia, Zimbabwe, Congo and Tanzania.*** *The main reason this paper focuses on these four Sub Saharan countries is that most countries within this region have been promoting economic development through their export activities and that a systematic research on export-growth linkage in these countries is limited.*
Methodology *- The paper employs econometric methods in time series (panel data method) consisting of Ordinary Least Square(OLS), Augmented Dickey Fuller (ADF test), Cointegration (using unrestricted VAR method), Residue tests - serial correlation and Granger causality test to examine the relationship between exports and economic growth in these four Sub Saharan Regions.*
Findings *- The examined results from the paper prove that exports indeed have a significant impact in a long run on economic development in selected countries regardless of linearity in observations among the countries.*
Originality/Value *– The paper provides a sufficiently long series of macroeconomic data. Results produced are unique as compared to previous studied carried out a decade ago when the economies were flat and this is noticeable by systematic increase in GDP and GDP per capita. Therefore, the change in GDPs has led to substantial improvements in most of these economies, thereby called for an investigation. Lastly, it is also important to note that during the period under investigation, the selected countries have had an enviable record of political stability among DCs with exception of Zimbabwe as compared to a decade ago; but the political factor in this study can be excluded a priori from the analysis.*

Keywords— Economic growth, Economic Led growth (ELG), Sub Saharan Regions.

1. INTRODUCTION

Poverty is the most crucial plague of our times. It is commonly agreed that in order to reduce the proportion of people living on less than $1 a day, developing countries need to substantially accelerate their economic growth by carefully opening their markets, (Emilio J. Medina-Smith 2000). It is also widely accepted among economists that economic growth is an extremely complex process, which depends on many variables such as capital accumulation (both physical and human), trade, price fluctuations, political conditions and income distribution, and even more on geographical characteristics, (Smith, Adam 1776). However, in this particular case it should be emphasized to the reader that the evidence obtained from the paper has primarily concentrated on one factor, and that is exports in determining the economic growth.

Traditionally, the role of international trade in the economic development has been an important topic for more than 200 years. Classical economists Adam Smith and David Ricardo (1776) were the first to raise awareness about the role of international trade in a country's economic development. They argued that a country could benefit considerably if it specialised in a certain commodity and then exported this commoditity to foreign countries that lacked this certain commodity.Another study was done by prominent economists Jeffrey Sachs and Andrew Warner (1995) who analysed the relationship between globalisation and economic performance. The findings of their research favor the promotion of international trade as a means of economic development.

The validity of these studies has also been fortified by China's miraculous economic performance. During decades of economic self-isolation for example, China suffered from severe economic stagnation and poverty. But, after abolishing its closed door policy, the country has been experiencing a spectacular economic growth. China's success has therefore, contributed to a growing consensus among development economists, policymakers and political leaders about the importance of promoting international trade.

However, despite the fact that in recent years many developing countries especially in Sub Saharan regions have been adopting similar export-driven development strategies, a systematic empirical research analysing the relationship between export and economic development is still lacking. Recent studies which included Ramona Sihona for Southern African countries, consisted some of the countries selected for study i.e Zambia and Zimbabwe (2006). Ramona's empirical tests produced negative results on export led growth for the period 1980-2002 for all the countries selected for this study with exception of Tanzania. Another study similar to Ramona's was carried out in Phillipine countries by Fumitaka(2007) who produced similar results intelling non causality between the two variables in his selected countries. In both cases, especially for Africa, studies have not been done in regard to export led growth and the main driving commodity for exports that if considered, could add value to economic growth in developing countries (DCs) as well as improve lives in many DCs countries.

Taking the gap into consideration, the paper employs econometric method in time series data using Vector Auto regression (unrestricated VAR) with the combination of ADF, OLS, residue test and granger causality to examine the relationship between exports and economic growth as well as examining the contributing factor/s of main export commodity to economic growth that if considered could contribute to economic growth in many Sub Saharan Countries.

2. OBJECTIVES AND PURPOSE OF THE CASE STUDY

The main objectives of the research was basically, to analyse the relationship between exports and economic growth(GDP), to determine the causality between the two variables and to examine the contributing factor of exports on the economic growth in developing countries.

Reasons for choosing four Sub Saharan regions as a case study included; firstly, a sufficiently long series of macroeconomic data is available. Secondly, during the period under investigation, the countries had an enviable record of political stability among DCs with exception of Zimbabwe; however, like stated before, the political factor need to be excluded a priori from the study. Thirdly, is that these countries have been promoting economic development through their export activities and that a systematic research on export-growth linkage in the region is limited. Lastly, there has been the systematic increase in GDP and GDP per capita, which has led to substantial improvements in most economic and social indicators. Several questions therefore arise. What were the main engines of growth? What was the role played by exports during the second part of the twentieth century?

2.2. PREVIOUS STUDIES VS. THIS STUDY

Emilio J. Medina-Smith (2000) review of his literature on export led growth hypothesis in Costa rica (ELG) stated the empirical evidence regarding the relationship between exports and growth not robust, and although the results of the study suggest that exports have a positive effect on the overall rate of economic growth and could be considered an "engine of growth" as the ELGH advocates, their impact was quantitatively relatively small, in both the short and the long-run.

Ousmanou Njikam (2003) objectives on Sub-Saharan paper also included; establishing the causal relationship between total exports (agricultural and manufactured) and economic growth in 21 countries. Ousmanou interests also included; finding the direction of the causation and examining whether the direction of this causation is reversed when countries under study changed from Import Substitution (IS) to export promotion (EP) strategies. In his study, only two empirical tests were regarded; ADF and granger to determine the relation, data collection period was in 1980s when growth in per capita Gross Domestic Product (GDP) was very slow.

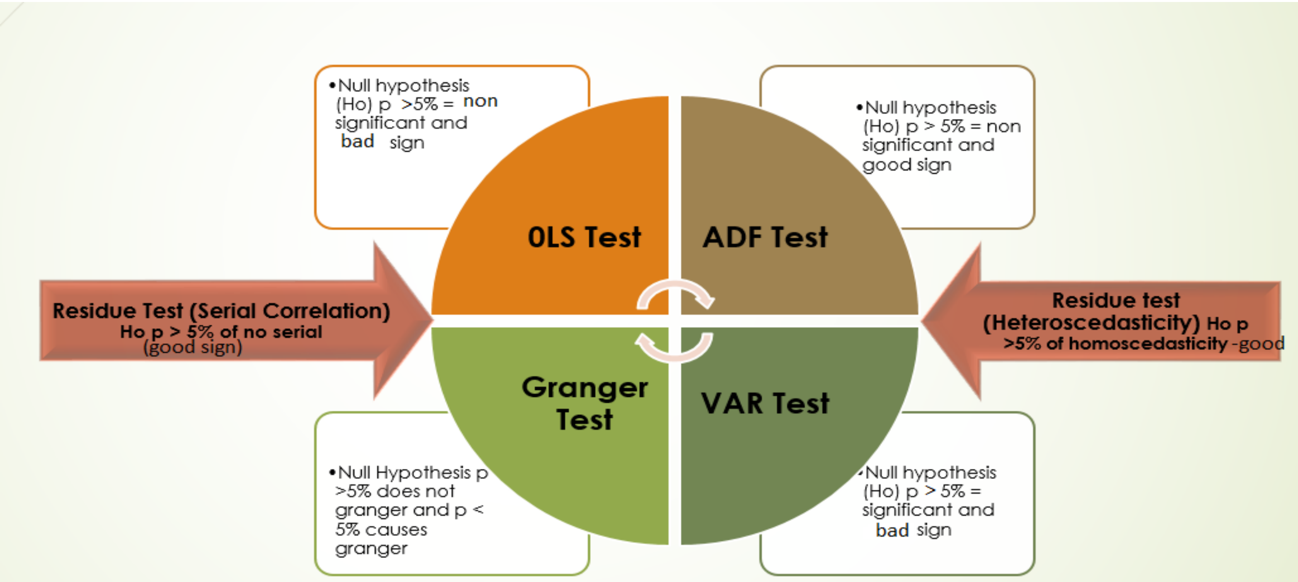
Ramona Sinoha-Lopete (2006) objectives on export led growth in Southern Africa were to examine the validity of the Export-Led Growth (ELG) hypothesis in nine Southern African countries using annual data for the period 1980-2002. The results indicated no causality between GDP and exports among selected countries like **Zambia and Zimbabwe.**

Fumitaka Furuoka (2007) Export Led Growth hypothesis in three BIMP-EAGA countries included examining the relationship between export and GDP in each of those countries. The econometric tests of the individual countries indicate that there has been no significant relationship between the size of national income and the amount of export in each of these countries.

This paper **"Exports and Economic Growth; New Evidence from Four Sub-Saharan Countries",** objectives included; analysing the relationship between exports and economic growth (GDP) using OLS test, determining the causality between the two variables using ADF, cointegration (VAR, unrestricted), and granger causality, as well as examining the main contributing factor of export (commodity) to economic growth in developing countries (Sub-Saharan) for the period **2006 - 2014**.

The empirical results produced showed a very strong evidence that despite the linearity (OLS in case of Zimbabwe) there exist strong relationship (in a long run) between the two variables exports and economic growth in selected countries. The results produced thereby, differ from the previous studies conducted by i.e. Ousmanou Njikam (2003) and Ramona (2006) for the period 1990-2002. Additionally, most of the tests performed, could not reject alternative hypothesis that they exist relationship between exports and GDP variables. In Granger-causality (short run) test on the other hand provided empirical support for an Export-driven growth rather than the growth driven exports hypothesis in all the countries with exception of Tanzania.

The study flow based it's analysis on both hypothesis: Null (H_0 – meaning exports is not a contributing factor to economic growth) and Alternative (H_A – meaning exports are a contributing factor to economic growth). Below was the work flow diagram.



3. THEORITICAL MODEL

The initial wave of favourable arguments with respect to trade can be traced to the classical school of economic thought that started with Adam Smith and which was subsequently enriched by the work of Ricardo, Torrens, James Mill and John Stuart Mill in the first part of the nineteenth century. Since then, the justification for free trade and the various and indisputable benefits that international specialization brings to the productivity of nations have been widely discussed and are well documented in the economic literature (Bhagwati, 1978; Krueger, 1978).

However, in the last decade there has been a surprising and impressive resumption of activity in the economic growth literature triggered by the endogenous growth theory, which has led to an extensive inventory of models that stress the importance of trade in achieving a sustainable rate of economic growth. These models have focused on different variables, such as degree of openness, real exchange rate, tariffs, terms of trade and export performance, to verify the hypothesis that open economies grow more rapidly than those that are closed (Edwards, 1998).

Although most models emphasized the link between trade and growth, they stressed that trade is only one of the variables that enter the growth equation. However, the advocates of the ELGH have stated that trade was in fact the main engine of growth in South-East Asia. They argue that, for instance, Hong Kong (China), Taiwan Province of China, Singapore and the Republic of Korea, the so-called Four Tigers, have been successful in achieving high and sustained rates of economic growth since the early 1960s because of their free-market, outward-oriented economies (World Bank, 1993).

The export-led growth hypothesis implies that an increase in export would lead to an increase in economic growth due to potential positive externalities derived from exposure to foreign market. Awokuse (2008) posited that an increase in international demand for domestic exportable products can cause an overall growth in output via an increase employment and income in the exportable sectors.

In addition, although the theoretical literature has frequently focused on the relationship between trade and economic growth (Adams, 1973; Crafts, 1973; Edwards, 1992; Scott, 1992), the interesting phenomenon is that "empirical examinations have typically examined the relationship between exports and growth" (Levine and Renelt, 1992, p. 953). Therefore, the next section briefly reviews the empirical literature related to the export-led strategy, considering in particular the role that exports played in output growth and paying close attention to the issue of causal links between exports and economic growth.

4. RESEARCH METHODS

A large number of empirical studies have been devoted during the last two decades to examine the role of exports on economic growth or ELG hypothesis, using either cross countries or time series data, on the ground of inquiry whether an export –led outward orienting policy is preferred to an inward orienting trade policy. The early studies on this issue scrutinise such relationship based on a simple correlation coefficient between export growth and economic growth. According to Mary Manneko Monyau, (2014) these studies generally concluded that there is strong support in favour of ELG hypothesis or there is a causative direction running from exports to economic growth based on the fact that export growth and growth are highly correlated.

The second group of study is based on two of the most commonly reported studies on regression are those conducted by (Ram 1985 and 1987). Ram's studies represented a transition from the correlation approach to some judgment of causality that could be achieved through regression applications. Ram (1985) used the production function regressing real output on capital, labour, and exports to test the ELG hypothesis on various countries. The countries included in the analysis varied from developed to less-developed countries It was found that export performance was important for economic growth for both developed and LDCs countries. The approach taken in this study was an improvement on previous studies because it included larger sample LDCs and within the sample, a greater fraction of low income countries.

The third group of studies took the approach of whether exports are driving output by estimating output growth regression based on the neoclassical growth accounting techniques of production function analysis, including exports of growth of exports as an additional explanatory variable, (Feder 1982, Balassa 1985, Kavoussi 1984 and Moschos 1989).The scholars in this group studies based their conclusion of the evidence of ELG hypothesis on the ground that firstly, the value of coefficient of export growth variable in the growth according equation exhibits highly significant positive correlation, and secondly, there is a significant improvement in the coefficient of determination in line with the inclusion of export growth variable in the regression equation. The criticism on this group of studies is based on methodological issue that, in general, they make a priori assumption that export growth causes output growth and do not consider the direction of causality between the two variables.

Fourth empirical studies focused on the HPAEs and other developing economies, and most of them are smaller in economic size, so the question is that whether export-led growth model is valid in a large developing economy, as pointed out by Perkins and Syrquin (1989), there are some differences between large and small economy in adopting the export-led growth model, namely (i) the larger the size of one country, the stronger the pressure on developing agriculture instead of foreign trade; (ii) The larger nations tend to have less dependency to overseas market for gaining economic efficiency and (iii) the larger economies have more variety of goods and services as well as a relative of more abundant resources thereby a lower requirement for trading with other nations.

Another study was conducted by Ramona Sinoha-Lopete (2006) Export led Growth in nine countries of Southern African using time series econometric techniques to test for the causal linkage between exports and economic growth in Southern Africa . Co-integration and causality between exports and economic growth were tested and compared using two types of bi-variate vector autoregressive models: models without exogenous variables VAR (p), and models with exogenous variables VARX (p, b). The results of the co-integration tests on both types of bi-variate models show that all three Granger-causality alternative models fit the ELG study for Southern Africa (stationary models; integrated but not co-integrated models; and Error Correction Models).

Lastly, another study was carried out by Fumitaka Furuoka (2007) on Export-led Growth Hypothesis: Evidence for BIMP-EAGA Countries in Philippines. The study used Johansen cointegration test and Granger causality test to examine the relationship between export and GDP in each of these countries as well as panel unit root test and panel cointegration test to examine the relationship between the variables in these three BIMP-EAGA countries as a whole. All the econometric tests of the individual countries indicated that there had been no significant relationship between the size of national income and the amount of export in each of these countries.

4.1. Econometric Methods

i. Panel Data (longitudinal data in time series)

The term panel data refers to multi-dimensional data frequently involving measurements over time. Panel data contain observations of multiple phenomena obtained over multiple time periods for the same firms or individuals. In biostatistics, the term longitudinal data is often used instead. [18]
Panel data are used when we suspect that the outcome variable depends on explanatory variables which are not observable but correlated with the observed explanatory variables. If such omitted variables are constant over time, panel data estimators allow to consistently estimate the effect of the observed explanatory variables, "in press". [19]

The basic linear panel models used in econometrics can be described through suitable restrictions of the following general model:

$$GDP_{it} = Y = \alpha + \beta_1 Ex_{it} + \varepsilon_{it} \qquad (1)$$

Where GDP_{it} is equal to Y (Output) which is the size of gross domestic product in country i in year t; Ex_{it} is the amount of export in country i in year t; α is the intercept; β_1 is the slope parameter; ε_{it} is the error term. To model individual heterogeneity, one often assumes that the error term has two separate components, one of which is specific to the individual and doesn't change over time. This is called the unobserved effects model:

$$Y_{it} = \alpha + \beta^{T} Ex_{it} + \mu i + \varepsilon_{it} \qquad (2)$$

The appropriate estimation method for this model depends on the properties of the two error components. The idiosyncratic error ε_{it} is usually assumed well-behaved and independent of both the regressors' Ex_{it} and the individual error component μi. The individual component may be in turn either independent of the regressors or correlated. If it is correlated, the ordinary least squares (OLS) estimator of β would be inconsistent, so it is customary to treat the μi as a further set of n parameters to be estimated, As if in the general model $\alpha_{it} = \alpha_i$ for all t. This is called the fixed effects (a.k.a. within or least squares dummy variables) model, usually estimated by OLS on transformed data, and gives consistent estimates for β (Y. Croissant and G. Millo, 2008).

The hypotheses on parameters and error terms (and hence the choice of the most appropriate estimator) are usually tested by means of:

- Pooling tests to check
- If the homogeneity assumption over the coefficients is established, the next step is to establish the presence of unobserved effects, comparing the null of spherical residuals with the alternative of group (time) specific effects in the error term,
- The choice between fixed and random effects specifications is based on Hausman-type tests, comparing the two estimators under the null of no significant difference: if this is not rejected, the more efficient random effects estimator is chosen,
- Even after this step, departures of the error structure from sphericity can further affect inference, so that either screening tests or robust diagnostics are needed.

The analysis of panel data in economics has become increasingly important in recent years as the number of dataset has grown along with econometric technique to analyse them. Therefore, the term "panel data" usually refers to data where the unit of observation varies in two or more dimensions.

4.2. Vector Auto Regression (VAR)

Vector auto regressions, VARs has become widely adopted in macroeconomics due to the so called Sims' critique, in (Sims, 1980). In line with this, Hamilton motivates the VAR by its "convenience for estimation and forecasting": meaning that VARs are easy to estimate and are useful for forecasting.

The VAR has another very important role as well, as a statistical model that underlies identified structural econometric models. This role is important both for the stationary case and for the case with unit-roots and (potential) co-integration. Three text-books that develop this viewpoint are: (Hendry 1955 and Johansen 1995).

A VAR model describes the evolution of a set of *k* variables (called *endogenous variables*) over the same sample period ($t = 1... T$) As a linear function of only their past values. The variables are collected in a $k \times 1$ vector y_t, which has as the i th element, $y_{i,t}$, the observation at time "t" of the i th variable. For example, if the i Th variable is GDP, then $y_{i,t}$ is the value of GDP at time t.
A *p-th order VAR*, denoted VAR (*p*), is

$$Y_t = C + A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p\, y_{t-p} + e_t, \qquad (3)$$

Where the *l*-periods back observation y_{t-l} is called the *l*-th *lag* of *y*, *c* is a $k \times 1$ vector of constants (intercepts), A_i is a time-invariant $k \times k$ matrix and e_t is a $k \times 1$ vector of error terms satisfying

1. $E(e_t) = 0$every error term has mean zero;
2. $E(e_t e'_t) = \Omega$ the contemporaneous covariance matrix of error terms is Ω (a $k \times k$ positive-semidefinite matrix);
3. $E(e_t e'_{t-k}) = 0$ for any non-zero *k* — there is no correlation across time; in particular, no serial correlation in individual error terms.

A *p*th-order VAR is also called a VAR with *p* lags. The process of choosing the maximum lag *p* in the VAR model requires special attention because inference is dependent on correctness of the selected lag order.
Order of integration of the variables.
Note that all variables have to be of the same order of integration. The following cases are distinct:

- All the variables are I(0) (stationary): one is in the standard case, i.e. a VAR in level
- All the variables are I(d) (non-stationary) with d > 0:

4.2.1. Concise matrix notation

One can stack the vectors in order to write a VAR (p) with a concise matrix notation:
Y=BZ +U

4.2.2. Writing VAR(*p*) as VAR(1)

A VAR with *p* lags can always be equivalently rewritten as a VAR with only one lag by appropriately redefining the dependent variable. The transformation amounts to stacking the lags of the VAR (*p*) variable in the new VAR (1) dependent variable and appending identities to complete the number of equations.
For example, the VAR (2) model.

$$Y_t = C + A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p\, y_{t-p} + e_t,$$

Can be recast as the VAR (1) model

$$\begin{bmatrix} y_t \\ y_{t-1} \end{bmatrix} = \begin{bmatrix} c \\ 0 \end{bmatrix} + \begin{bmatrix} A_1 & A_2 \\ I & 0 \end{bmatrix} \begin{bmatrix} y_{t-1} \\ y_{t-2} \end{bmatrix} + \begin{bmatrix} e_t \\ 0 \end{bmatrix}, \qquad (4)$$

Where *I* is the identity matrix.
The equivalent VAR (1) form is more convenient for analytical derivations and allows more compact statements.

- The variables are cointegrated: the error correction term has to be included in the VAR. The model becomes a Vector error correction model (VECM) which can be seen as a restricted VAR.
- The variables are not cointegrated: the variables have first to be differenced d times and one has a VAR in difference.

Sims advocated VAR models, criticizing the claims and performance of earlier modelling in macroeconomic econometrics. He recommended VAR models, which had previously appeared in time series statistics and in system identification, a statistical specialty in control theory. Sims advocated VAR models as providing a theory-free method to estimate economic relationships, thus being an alternative to the "incredible identification restrictions" in structural models.

4.3. Variance of Residues

4.3.1. Serial Correlation

Serial correlation is a common occurrence it time series data because the data is ordered (over time); it is therefore, not surprising that neighbouring error terms turn out to be correlated.
Serial correlation violates the standard assumption of regression theory that error terms are uncorrelated.
If serial correlation is untreated, it leads to a number of issues;

- Reported standard errors and t-statistics are invalid (even asymptotically).
- Coefficients may be biased though not necessarily inconsistent (if data is weekly dependent).
- In the presence of lagged dependent variables, OLS estimates are biased and inconsistent

Fortunately, Eviews provides tools for detecting serial correlation and correcting regressions to account for its presence.

4.3.2. Heteroscedasticity

Heteroscedasticity is a term used to describe the situation when the variance of the residuals from a model is not constant. [25] When the variance of the residuals is constant, we call it homoscedasticity. Homoscedasticity is desirable. If residuals do not have constant variance, we call it heteroscedasticity, which is not desirable. **How the heteroscedasticity may form; (1)** Incorrect model specification, and (2) Incorrectly transformed data, **Hypothesis setting for heteroscedasticity**

Null hypothesis H_o: Homoscedasticity (the variance of residual (u) is constant)
Alternative hypothesis H_1: Heteroscedasticity (the variance of residual (u) is not constant)

4.3.2.1. White's Heteroscedasticity Test

White's (1980) test was used as a test of the null hypothesis of no heteroscedasticity against heteroscedasticity of unknown, general form. The test statistic was computed by an auxiliary regression, where we regress the squared residuals on all possible (nonredundant) cross products of the regressors. For example, suppose we estimated the following regression:

$$Y_T = b_1 + b_2 x_t + b_3 z_t + e_t \qquad (3)$$

Where the b are the estimated parameters and e the residual. The test statistic is then based on the auxiliary regression:

The Obs*R-squared statistic is White's test statistic, computed as the number of observations times the centred R^2 from the test regression. The exact finite sample distribution of the *F-statistic* under H_0 is not known, but White's test statistic is asymptotically distributed as an X^2 with degrees of freedom equal to the number of slope coefficients (excluding the constant) in the test regression.

4.4. The Augmented Dickey Fuller

The Augmented Dickey-Fuller (ADF) test is a commonly used Unit-root test fitting an AR (k) model, the test examines the null hypothesis of ARIMA (p, 1, 0) process against the stationary ARIMA (p +1, 0, 0) alternative.
If a non-stationary series, Y_T must be differenced d times before it becomes stationary, then it is said to be integrated of order d. We write;
$Y_T \sim I(d)$. So if $y \sim I(d)$ then $\Delta^d Y_T \sim I(0)$.
An I (0) series is a stationary series.

An I (1) series contains one unit root, e.g. Y_T = yt-1 + ut

4.4.1. Dickey Fuller Test

The early and pioneering work on testing for a unit root in time series was done by Dickey and Fuller (Dickey and Fuller 1979, Fuller 1976). The basic objective of the test is to test the null hypothesis that φ =1 in:

$$Y_T= \varphi yt\text{-}1+ ut \qquad (4)$$

Against the one-sided alternative φ < 1. So we have H_0: series contains a unit root vs. H_1: series is stationary. The regression is usually used:

$$\Delta y_t= \psi yt\text{-}1+ ut \qquad (5)$$

So that a test of φ=1 is equivalent to a test of ψ=0 (since φ- 1=ψ).

4.4.2. Critical Values:

The null hypothesis of a unit root is rejected in favor of the stationary alternative in each case if the test statistic is more negative than the critical value.

Table 4.4.2: Critical Values for DF and ADF Tests (Fuller, 1976, p373).

Significance Levels	**10%**	**5%**	**1%**
C.V for constant but no trend	-2.57	-2.86	-3.43
C.V for constant and trend	-3.12	-3.41	-3.96

The null hypothesis is rejected if τ_t is less than the tabled value. The percentiles of τ are considerably less than the corresponding percentiles of τ_t, indicating τ_μ the effects of including time as an explanatory variable. For example, the asymptotic .01 percentage point of τ_t is at −3.96 for τ_t, compared with −3.43 for τ_μ

In this study, the econometrics procedure to be used follows these steps mostly taken from Dickey and Fuller. This study will follow all steps for the following reasons: to ensure that all variables included in the study are stationary either in levels or in first differences (unit root tests), to determine the direction of causation between GDP and exports.

4.5. Granger Causality

The Granger, (1969) approach to the question of whether x causes y is to see how much of the current y can be explained by past values of y and then to see whether adding lagged values of x can improve the explanation. Y is said to be Granger-caused by x if x helps in the prediction of y, or equivalently if the coefficients on the lagged x's are statistically significant. Note that two-way causation is frequently the case; x Granger causes y and y Granger causes x.
It is important to note that the statement "x Granger causes y" does not imply that y is the effect or the result of x. Granger causality measures **precedence and information** content but does not by itself indicate causality in the more common use of the term.

When using Eviews, it is important to use more rather than fewer lags, since the theory is couched in terms of the relevance of all past information. Picking a lag length, l corresponds to reasonable beliefs about the longest time over which one of the variables could help predict the other.
Eviews runs bivariate regressions of the form:

$$Y_T = \alpha_0 + \alpha_1 y_{t-1} + \alpha_1 y_{t-1} + \beta_1 x_{t-1} + \ldots + \beta_1 x_{-1} + \varepsilon_t \qquad (7)$$

$$X_t = \alpha_0 + \alpha_1 x_{t-1} + \ldots + \beta_1 y_{t-1} + \ldots + \beta_1 y_{-1} + u_t \qquad (8)$$

For all possible pairs of (x, y) series in the group. The reported *F-statistic*s are the Wald statistics for the joint hypothesis:

$$B_1 = \beta_2 = \ldots = \beta_t = 0 \qquad (6)$$

For each equation. The null hypothesis is that x does *not* Granger-cause y in the first regression and that y does *not* Granger-cause x in the second regression.

5. VARIABLES AND DATA SOURCE

The data are derived from both national and international statistical year books.

The data used in this analysis have a number of limitations, and they should be highlighted. First, the sample period is limited to **2006-2014** because of the non-availability of official national account data prior to this period. Consequently, the estimates obtained using some of the current econometric techniques have some limitations that must be taken into account.

Second, owing to the shortage of reliable quarterly data for most of the variables under consideration for the entire period, the periodicity of all the data used in this investigation is annual.

We now turn our attention to the problem of how the period for the estimations was chosen and the ultimate sample size used to estimate the model. A priori, there were two options for selecting the period: one was straightforward and consisted in using the whole sample period available (2006-2014), and the other was to focus on a specific period which had a substantial and distinctive economic and, possibly, political regime.

Finally, it is appropriately to mention that all the empirical estimations in this study were carried out using the time series econometric software Eviews 3.1, developed by Quantitative Micro Software.

6. RESULTS AND DISCUSSION

6.1. Hypothesis Testing

- Alternative Hypothesis (H_A) – Exports contribute to economic growth.
- Null Hypothesis (H_0) – Exports do not contribute to economic growth

6.1.2. Testing for Least Ordinary Square (OLS)

Prior to testing for a causal relationship between the time series, the first step was to check the relationship between variables using OLS estimator. For this purpose, all the variables were examined through graphical inspection of their time series plots using regression analysis. The variables are gross domestic product (y) and real export of goods and services (x). Below were the results of the observation obtained from four regions and their graphical analysis.

Figs 6.1.2: Four Sub Saharan Region data and Regression Analysis for the period 2006 - 2014

Zambia

Year	Exports	GDP
2006	1105.4	12.76
2007	1520.8	14.06
2008	1546.7	17.91
2009	1735.8	15.33
2010	2895.8	20.27
2011	3611.3	23.73
2012	4005.8	24.94
2013	5163.3	26.82
2014	4969.5	27.07

Zimbabwe

Year	Exports	GDP
2006	1602	5.44
2007	1732	5.29
2008	1711	4.42
2009	1675.2	8.16
2010	2249.75	9.46
2011	3245.45	10.96
2012	3557.3	12.47
2013	467.41	13.49
2014	256	13.66

Congo

Year	Exports	GDP
2006	2698.7	14.3
2007	6147.9	16.36
2008	6869.8	19.2
2009	4371	18.26
2010	8477.9	20.52
2011	9471.9	23.83
2012	8534.2	27.45
2013	10904.9	30.63
2014	12981.9	32.96

Tanzania

Year	Exports	GDP
2006	273	18.61
2007	299	21.5
2008	375	27.39
2009	491	28.57
2010	614	31.11
2011	647	33.56
2012	628	38.8
2013	684	44.33
2014	809	49.18

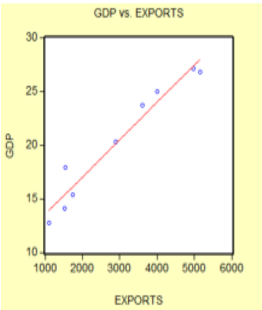


Fig 1. GDP Vs Exports -Zambia

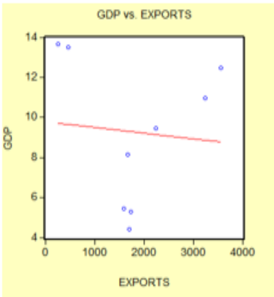


Fig 2. GDP Vs Exports -Zimbabwe

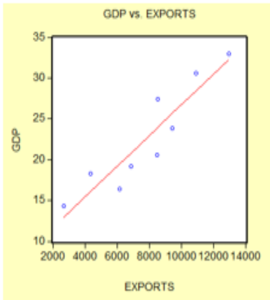


Fig 3. GDP Vs Exports -Congo

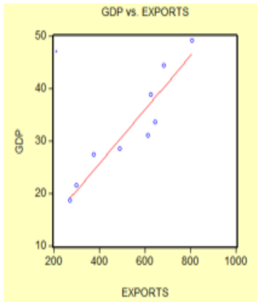


Fig 4. GDP Vs Exports -Tanzania

6.1.3. Estimated equations Results:

GDP = C (1) + C (2)*EXPORTS

Where C1 and C2 are termed as coefficients (intercept and slope parameters respectively for an equation) usually used in panel data analysis and parameters were substituted as follows;

1. **Zambia**

GDP = 10.06826514 + 0.003474965118*EXPORTS (9)

2. **Zimbabwe**

GDP = 9.766896283 - 0.0002759478779*EXPORTS (10)

3. **Congo**

GDP = 7.893894479 + 0.001880050153*EXPORTS (11)

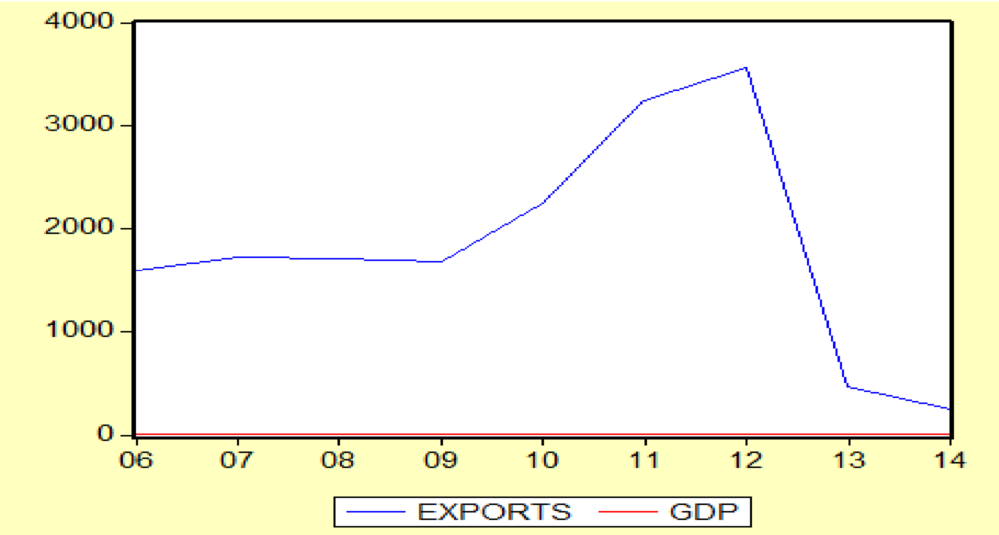
4. **Tanzania**

GDP = 5.155997932 + 0.05117137316*EXPORTS (12)

The coefficient for each explanatory variable reflects both the strength and type of relationship the explanatory variable has to the dependent variable. When the sign associated with the coefficient is negative, the relationship is negative; in the case of **Zimbabwe (null hypothesis could not be rejected = significant)**. On the other hand, when the sign is positive, the relationship is positive in this case **Zambia, Congo and Tanzania (non-significant and good sign),** thereby, rejecting the null hypothesis. The coefficient reflects the expected change in the dependent variable for every 1 unit change in the associated explanatory variable, holding all other variables constant.

Briefly looking at Zimbabwean Economic outlook in accordance with {*Mary Manneko Monyau,* 2014), she asserted that Zimbabwe's economy remains in a fragile state, with an unsustainably high external debt and massive deindustrialization and informalisation. According to the publication, the average GDP growth rate of 7.5% during the economic rebound of 2009-12 is moderating. This economic slowdown is due to liquidity challenges (e.g. the lack of and high cost of capital and revenue underperformance), outdated technologies, structural bottlenecks that include power shortages and infrastructure deficits, corruption and a volatile and fragile global financial environment. The constrained fiscal space has forced the government to adopt a contractionary fiscal policy stance, while the use of the multi-currency regime limits the use of monetary policy instruments. The figure below represents economic downward trend of Zimbabwean economy.

Fig. 6.1.3b: Zimbabwe Exports vs. GDP 2006 - 2014



Zimbabwean economy business cycle between the periods of 2006 to 2014.

The Ordinary least Square **(OLS - table 1)** below explains both the Multiple R-Squared and Adjusted R-Squared values which measure the model performance. Possible values range from 0.0 to 1.0 and the coefficient determination must be 0.65, which mean that 65% of the variation in mean reading score among the different classes can be predicted from the relation. Meaning, the closer the model is to 1, the better. The relationship therefore, is in support of **Zambia, Congo and Tanzania** but, rejected for **Zimbabwe**.

Table 6.1.2. Summary for OLS Results

Null hypothesis (Ho) p < 5% = significant = good sign
Alternative hypothesis H_A> 5% = non-significant = bad sign

	R Squared	Adjusted R2	STD Error	t- statistic	Probability
Zambia	0.946	0.939	0.0003	11.0998	0
Zimbabwe	0.0069	-0.1349	0.0012	-0.221	0.8314
Congo	0.85	0.829	0.0003	6.3077	0.0004
Tanzania	0.887	0.871	0.0069	7.4179	0.0001

The T test in table 1 was used to assess whether or not an explanatory variable was statistically significant. The null hypothesis was that the coefficient is, for all intents and purposes, equal to zero.

The probability in the table assesses model significance, in the above case, Joint Wald Statistic was used. The null hypothesis for the tests included that the explanatory variables for Zimbabwe (p value greater that 5%) was non-significant. Therefore, null hypothesis for Zimbabwe could not be rejected. Meaning that the independent variable (exports) in the model do not affect the GDP.

6.2. Testing for Unit Root

To test the level of integration of the variables, the augmented Dickey-Fuller (ADF) test was used. The aim was to determine whether the variables follow a non-stationary trend and are in fact of the order of 1 denoted as I(1) or whether the series are stationary, i.e. of the order of 0 denoted as I(0).

First, if the series are non-stationary the use of classical methods of estimation such as OLS could lead us to mistakenly accept spurious relationships, and thus their results would be meaningless.

Second, in cases where the series are non-stationary around their mean, the traditional suggestion was to differentiate the series. This usually leads to stationarity, allowing the researcher to apply conventional econometrics (Granger and Newbold, 1974). However, first differencing is certainly not an appropriate solution to the above problem and has a major disadvantage: it prevents detection of the long-run relationship that may be present in the data, i.e. the long-run information is lost, which is precisely the main question being addressed.

Table 6.2: Summarised ADF Test Statistic.

Augumented- Dickey Fuller Unit Root Test

Country	t-Statistic	1st Difference intercept & trend	2nd Difference intercept & Trend
Zambia	***-0.594	***-2.199	-10.516
P-value	0.581	0.115	0.06
Zimbabwe	***-0.516	**-3.076	-9.692
P-value	0.633	0.054	0.066
Congo	***0.567	***-2.885	-17.586
P-value	0.602	0.102	0.036
Tanzania	***0.623	***-2.813	***-1.765
P-value	0.567	0.107	0.2

Notes: *** indicates significance at 1% level
** indicates significance at 5% level
* indicates significance at 10% level

Note: The null hypothesis of a unit root is rejected in favor of the stationary alternative in each case if the test statistic is more negative than the critical value.

Table 6.2 present the results of the ADF test. The results obtained provide strong evidence that all the time series in levels are non-stationary, which means they are integrated at an order of 1, for example I(1) at above 95 per cent confidence level. Thus, they have a stochastic trend and they indicate that the null hypothesis cannot be rejected for any of the variables under scrutiny.

In addition, when taking second differences, in the case of Zambia, Zimbabwe and Congo, the tests strongly reject the unit root, which means that they are integrated at an order of 0, i.e. I (0) at the 95 per cent confidence level, which means that they are stationary.

The results of the unit root tests performed corroborate previous findings in the empirical literature, i.e. as with most macroeconomic series, the variables under consideration in this study appear to be non-stationary and trended in levels. Only their second differences are stationary **(for Zambia, Zimbabwe and Congo)**. Considering that the data appear to be stationary in second differences in three countries, no further tests are performed.

Since the series are I(1), the use of econometric techniques such as OLS and the use of tests such as t-tests and F-tests can lead to mistaken (false) acceptance of spurious relationships between the variables. Actually, these regressions produce empirical results that are characterized by high levels of R^2, which suggests the existence of a statistically significant relationship between the variables in the estimated model.

If, by contrast, the variables are found to have been stationary, it is not necessary to proceed to testing for cointegration since classical regression methods of estimation such as OLS are appropriate and can be applied to stationary variables in levels. Ultimately, if the variables are found to be integrated at different orders, it is possible to conclude that various subsets of variables under consideration indicate some cointegration. However, further analysis would obviously be required to test this conjecture.

The contribution of Engle and Granger (1987) was to demonstrate that although the individual series could be non-stationary, i.e. they are $I(1)$, like those previously examined, a linear combination of them might be stationary, i.e. $I(0)$.

Consequently, the next section of the empirical study investigates whether the series under scrutiny are integrated, so that a well-defined linear relationship exists among them in the long run. Thus, we proceed to test for unrestricted cointegration using VAR analysis between the variables on levels using several tests, all of which are based on the null hypothesis of existence of causality between variables.

6.3. Testing for Vector Auto regression (unrestricted VAR)

Note: P-value < 5% = Significant = Desirable

P–value of > 5% = non significance = not desirable

Table 6.4

Vector Auto Regression (VAR) - VAR estimate

Country		Dependant Variable		Significance Effect P-value	Country		Dependant Variable		Significance Effect P-value
		GDP	EXPORTS				GDP	EXPORTS	
	GDP (-1)	0.329	236.218			coefficient>>	0.811	260.135	
		0.941	229.24			std err>>	0.657	201.219	
		0.349	1.03			t value>>	1.235	1.293	
	GDP (-2)	1.043	400.08				0.021	254.724	
		0.979	238.53				0.893	273.825	
Zambia		1.066	1.677		Zimbabwe		0.024	0.93	
	EXPORTS(-1)	0.004	0.506	0			0	0.14	0.0002
		0.003	238.53				0.001	0.291	
		1.459	0.736				0.351	0.481	
	EXPORTS(-2)	-0.007	-2.004				0	-2.865	
		0.007	1.654				0.003	0.854	
		-1.021	-1.212				0.064	-3.357	
	C	0.584	-5561.3				1.662	3611.432	
		16.977	4137.91				3.329	1020.18	
		0.034	-1.344				0.499	3.5399	
Country									
		GDP	EXPORTS	P value			GDP	EXPORTS	P value
	GDP (-1)	0.474	-248.852			coefficient>>	0.448	6.006	
		1.438	925.223			std err>>	0.34	4.756	
		0.329	-0.269			t value>>	1.319	1.263	
	GDP (-2)	0.535	1065.366				0.751	12.985	
		1.121	721.329				0.502	7.028	
Congo		0.477	1.477		Tanzania		1.496	1.847	
	EXPORTS(-1)	0.0005	0.109	0			-0.041	0.673	0
		0.001	0.881				0.015	0.213	
		0.39	0.124				-2.674	3.163	
	EXPORTS(-2)	-8.09E-05	-0.622				0.034	-0.624	
		0.001	0.532				0.011	0.156	
		-0.098	-1.168				3.073	-3.978	
	C	-0.229	-3657.55				5.664	-19.59	
		4.797	3085.49				2.574	36.03	
		-0.048	-1.185				2.201	-0.544	

Note: Standard errors and t-statistics are in parentheses; the p-values included were obtained from significance test of model which explained the dependent variable.

Table 6.3 explains independent variable (Exports) significantly affecting the dependent variable GDP, the sign is good and desirable.

The null hypothesis is rejected since p < 5% confidence level (which is significant), is therefore, indicating that exports can influence the dependent variable GDP. A very good positive sign.

6.4. <u>Residue tests results</u>

Summary of the residue test

Country	Breusch Godfrey Serial Correlation LM Test (Obs* R2)	Normality(Jarque Bera p value)	Heteroscedasticity (Obs* R2)
Zambia	0.095	0.711	0.428
Zimbabwe	0.356	0.7	0.557
Congo	0.059	0.703	0.116
Tanzania	0.086	0.704	0.186

6.4.1. Serial Correlation LM Test

This test is an alternative to the *Q-statistic*s for testing serial correlation. The test belongs to the class of asymptotic (large sample) tests known as Lagrange multiplier (LM) tests.

The null hypothesis of the LM test is that there is no serial correlation up to lag order P, where P is a pre-specified integer. The local alternative is ARMA(r, q)) errors, where the number of lag terms P = max (r, q)). Note that this alternative includes both AR (P) and MA (P) error processes, so that the test may have power against a variety of alternative autocorrelation structures. See Godfrey (1988).

The Obs*R-squared statistic is the Breusch-Godfrey LM test statistic and the results indicated in all the countries are greater than p value of 5% confidence level indicating, no serial correlation in all observation, which is a good sign.

6.4.2. Normality Test

Table 4 also displayed descriptive statistics of the residuals, including the Jarque-Bera statistic for testing normality. From the results obtained in all regions, indicated the residuals being normally distributed, meaning that the histogram are bell-shaped and the Jarque-Bera statistic is not significant; see results in all regions are above 5% significance level, a good sign as well. Therefore we fail to reject the null hypothesis.

6.4.3. Heteroscedasticity Tests

White’s (1980) test is a test of the null hypothesis of no heteroscedasticity against heteroscedasticity of unknown, general form. The test statistic is computed by an auxiliary regression, where we regress the squared residuals on all possible (nonredundant) cross products of the regressors.

White also describes this approach as a general test for model misspecification, since the null hypothesis underlying the test assumes that the errors are both homoscedastic and independent of the regressors, and that the linear specification of the model is correct. Failure of any one of these conditions could lead to a significant test statistic. Conversely, a non-significant test statistic implies that none of the three conditions is violated.

The above output contains another set of test statistics (heteroscedasticity), and the results of the auxiliary regression on which they are based. All four statistics in all Sub Saharan region fail to reject the null hypothesis of homoscedasticity (p value >5%), which is good sign again.

6.5. Granger Causality Test

Causality defines the relationship between two variables. Assume that the information set F_t has the form (x_t, z_t, x_{t-1}, z_{t-1}... x_1, z_1), where x_t and z_t are vectors (that includes scalars of course) and z_t usually will include y_t and z_t may or may not include other variables than y_t.

By definition: We said that x_t is Granger causal for y_t wrt. F_t if the variance of the optimal linear predictor of y_{t+h} based on F_t has smaller variance than the optimal linear predictor of y_{t+h} based on z_t, z_{t-1} ... - for any h. In other word x_t is Granger causal for y_t if x_t helps predict y_t at some stage in the future (see Toda and Phillips (1991).

Table 6.5: Granger Causality Test results

Direction of Causality	F-statistic	P-value	Lag	Decision	Outcome
		Zambia			
EXP→GDP	1.345	0.426	2	Null hypothesis not rejected	Exp does not granger GDP
GDP→EXP	1.409	0.415			GDP does not granger Exp
		Zimbabwe			
EXP→GDP	0.063	0.941	2	Null hypothesis not rejected	Exp does not granger GDP
GDP→EXP	2.9997	0.25			GDP does not granger Exp
		Congo			
EXP→GDP	0.138	0.879	2	Null hypothesis not rejected	Exp does not granger GDP
GDP→EXP	4.121	0.195			GDP does not granger Exp
		Tanzania			
EXP→GDP	5.071	0.165	2	Null hypothesis not rejected	Exp does not granger GDP
GDP→EXP	22.266	0.043		Null hypothesis rejected	GDP causes granger

- **If P < 5% then H (A) (Alternate hypothesis is accepted)**
- **If P > 5% then H (o) (Null hypothesis is accepted)**

The Granger-causality test provided empirical support for an Export-driven growth rather than the growth driven exports hypothesis in case of in all the countries with exception of Tanzania.

In short, empirical evidence obtained in this study does not support the existence of a long-run relationship and causality between exports and GDP in Zambia, Zimbabwe and Congo but does for Tanzania. Thus, the findings on this research provide no empirical evidences to support the ELG hypothesis in the context of Zambia, Zimbabwe, and Congo, but does for Tanzania.

We can therefore conclude that the component of Granger causality is that of independent since variable x (export) and y (GDP) have failed to granger-cause the other in the case of Zambia, Zimbabwe and Congo. But we have identified unidirectional Granger-Causality from GDP to Exports for Tanzania.

We would therefore, provide policy makers with important knowledge using examples of (Sims, 1972) findings in case of Tanzania that if GDP variable were to increase, there is a need to increase Export variable.

7. CONCLUSION

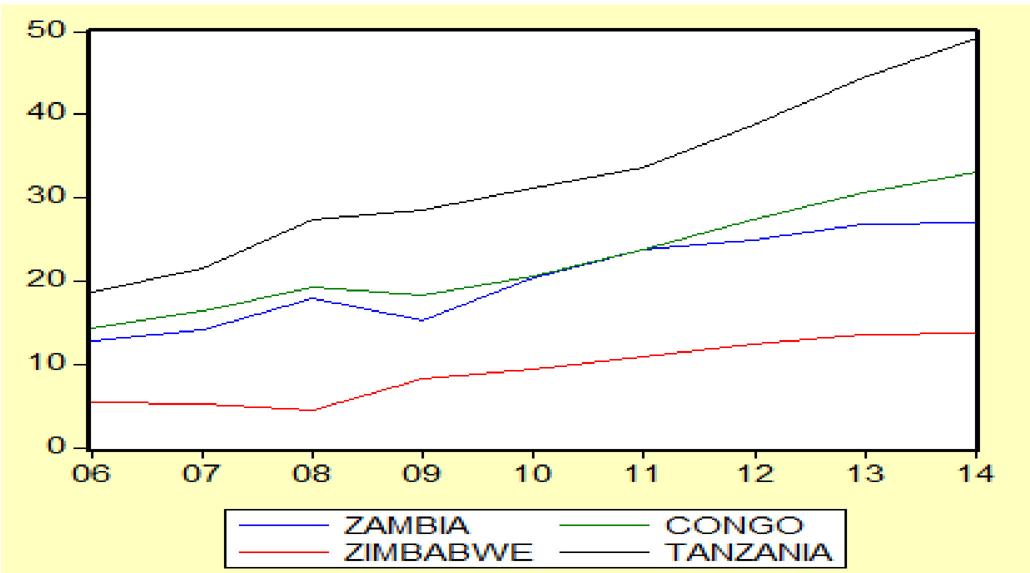
Trade has provided significant impulses for global growth and has led to measurable improvements in the current accounts of some countries. Taking these facts into consideration, this paper conducted an empirical analysis of the relationship between exports and development in four Sub Saharan countries, namely, Zambia, Zimbabwe, Congo and Tanzania.
The empirical findings lead to a conclusion that supported alternative hypothesis which indicated that there is sufficient empirical evidence to support significant positive relationship between the size of national income and the amount of exports in the four selected developing nations.

On the basis of annual data extending from 2006 to 2014, the tests detect the existence of a long relationship between GDP and exports. That is, the results suggest that the variables under consideration are cointegrated (under unrestricted VAR estimation) and therefore share a linear common trend, i.e. they move together in the long term.

Additionally, exports do explain not only cyclical changes in output (short-term) but also the long-term trend of output. And, the fact that the results obtained through the unrestricted VAR model indicate that all the variables had the correct sign, and were significant, corroborates the view that exports were not only significant in determining the overall rate of growth of output in the long run, but also indicates that they were a significant variable in the growth process.

Tanzania has proven to come out the strongest in ELG Hypothesis amongst the four selected Sub Saharan Countries, followed by Congo and Zambia and Zimbabwe appearing the least.

Fig 6: GDP vs. Period for Selected Countries



6.1. Reason behind Tanzania doing well in economic growth.

- Tanzania depends much on **agriculture** for exports than any other exporting commodity such as mining.

- Tanzania main export partners covers almost 80% of developed countries, thereby attracting revenues in terms of trading terms and exchange rates. Refer below information;

Table 6.1 below **(online statistical information** www.tradingseconomics.com **)** highlights main exporting commodities for each country and exports partners each country has opened market to and amount of GDP the country attracts.

Table 6.1: Countries and Exporting commodities

Country	Exporting commodities	main exports partners	2014 GDP (USD Billion)
Tanzania	tobacco, coffee, cotton, cashewnuts, tea and cloves being the most important. Other exports include gold and manufactured goods.	India, Japan, China, United Arab Emirates, Netherlands and Germany	48.34
Congo	diamonds, gold, zinc, copper, timber and coffee	the United States and China (60 percent of total exports). Others include: Belgium, Finland and Zambia.	33.12
Zambia	main export, copper accounts for 70 percent, sugar, tobacco, gemstones, cotton and electricity.	Switzerland (45 percent of total exports). Others include: China (20 percent), South Africa, United Kingdom, Zimbabwe and Congo-Kinshasa.	27.07
Zimbabwe	main exports are tobacco (23 percent of total exports) and nickel (20 percent), diamonds, platinum, ferrochrome, and gold	South Africa, China, Congo and Botswana.	14.2

Additionally, it is reasonable to recognize that a large number of factors, such as capital accumulation, consumption, imports, innovation and human capital accumulation, determine economic growth. However, in this particular case it should be emphasized to the reader that the evidence obtained from the supply side implies that growth was driven primarily concentrated on one factor taken, which was exports and **agriculture in the case of Tanzania** acted as an engine of growth.

8. Future Research

Future inquiries on the relationship between exports and economic growth could incorporate additional variables not included in this study in order to obtain a deeper insight into the complex issues of economic development process in Sub Saharan countries.

Future research studies could go beyond the two-variable model (i.e., exports and growth) and incorporate other independent variables, such as labour, capital, investment and consumption.

Globalization and trends in regional economic integration processes (for example; Zambia, Zimbabwe, Congo and Tanzania) will undoubtedly have a significant impact on developing economies in the region. This fact should also be taken into consideration. Therefore, it is possible that in the future, the ELG hypothesis could become increasingly relevant in the Sub Saharan region.

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Figures

Tables

References

Crafts, N. F. R. 1973 "Trade as a handmaiden of growth: An alternative view", *Economic Journal*. pp. 875-84.

Edwards, S. 1992. Trade orientation, distortions and growth in developing countries, pp. 31-57, Journal of Development Economics, 39.

Edwards, S. 1998. "Openness, productivity and growth: What do we really know?", Unpublished.

Emilio J. Medina-Smith, 2000. Policy issues in international trade and commodities study, series No. 7, in press.

Fumitaka Furuoka, 2007. Export- Led growth, Philippine Journal of Development Number 63, Volume XXXIV, Number 2. published

Krueger, A. O. 1978. Foreign Trade Regimes and Economic Development: Liberalization Attempts and Consequences. Cambridge, MA: Ballinger press, pp. 383-98.

Levine, R. and Renelt, D. 1992. A sensitivity analysis of Cross-Country Growth Regressions, 1992, pp. 942-63.

Maddala, G.S. and S. Wu. 1999. A comparative study of unit root tests with panel data and a new simple test. *Oxford Journal of Economics and Statistics*(Special Issue):631–652

Mary Manneko Monyau, 2014. African Economic Outlook, AfDB, OECD, UNDP, pp. 2.

Monterrey Consensus, 2008. Review Session on International Trade as an Engine of Growth for Development, pp.19-20.

Ousmanou Njikam, 2003. Exports and Economic Growth in Sub-Saharan Africa: Is There a Connection?

Ram, R. 1985. Exports and economic growth: Some additional evidence", Economic Development and Cultural Change, pp. 415-25.

Ram, R. 1987. Exports and economic growth in developing countries: Evidence from Time-Series and Cross-Section Data, Economic Development and Cultural Change, 36, 1, pp. 51-63.

Ramona Sinoha-Lopete, 2006. Export led growth in Southern Africa. Unpublished

Sam Laird and Santiago Fernández de Córdoba, 2006. United Nations Conference on Trade and Development (UNCTAD). eds. UNCTAD, Palgrave-McMillan. Published

See, for instance Feder(1982), Balassa(1985), Kavoussi(1984) and Moschos(1989). Unpublished.

Smith, Adam, 1776. An inquiry into the nature and causes of the wealth of nations. Reprinted in 1977 London: J.M. Dent and Sons.

Perkins, D. H and Syrquins, M, 1989. The influence of size, in part of Handbook of Development Economics volume 2(Ed.) H. Chenery and T. N. Srinivasan, Amsterdam, Elsevier.

World Bank, 1993. *The East Asian Miracle: Economic Growth and Public Policy*. In Press.

