

# The causal Relationship among Financial Development, Trade Openness and Economic Growth in Nigeria

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## Abstract

The purpose of this study was to examine the causal relationship among financial development, trade openness and Economic Growth in Nigeria for the period 1970-2005. The econometric methodology employed was the Cointegration and Granger Causality test. The stationarity properties of the data and the order of integration of the data were tested using both the Augmented Dickey-Fuller (ADF) test and the Phillip-Perron (PP) test. The variables tested stationary at first differences. The Johansen multivariate approach to cointegration was applied to test for the long-run relationship among the variables but there were no cointegrating relations between Growth, trade openness and the three measures of financial development (Direct Credit, Private Credit and Money supply). The Granger-causality empirical findings suggest that trade openness and financial development does have causal impact on economic growth; conversely growth have causal impact on trade and financial development, implying support for growth-led trade but no support for trade-led growth. Domestic credit, Private credit and broad money, as percentages of GDP showed no causal impact on economic growth rather economic growth was seen to necessitate these credits and the supply of money. Also, Money supply was the only instrument of financial development that was seen to cause Trade openness.

**Keywords:** Financial Development, Trade Openness, Economic Growth, Nigeria

## 1. Introduction

The relationship between openness to international trade and economic growth, and financial development and economic growth are the subject of a vast number of both theoretical and empirical literatures, (Roubini and Sala-i-Martin, 1991). The conventional wisdom is that openness to international trade and financial development has a positive impact on economic growth. The reason for the argument is partly based on the conclusions of many empirical studies, which claim that outward-oriented economies consistently have higher economic growth rates than inward-oriented economies. It is also partly due to the failures of import-substitution strategies, particularly in the 1980s and overstated expectations from trade liberalisation (Yanikkaya, 2003: 57). Lloyd and MacLaren (2000) argue that the fast-growing East Asian economies were partly a result of their early openness to international trade; less openness of economies to international trade will slow down their economic growth rates.

The objective of this study is to investigate the causal relationship between financial development, trade openness and economic growth in Nigeria. Previous empirical studies are ambiguous on the direction of causality between the three variables. Furthermore none of these studies has its focus on Nigeria. This further motivates this study. Accordingly, the objective of this paper is to identify the causal links between these three macroeconomic variables in Vector Auto-Regression (VAR) framework for Nigeria. To be specific, the objectives are to examine whether in Nigeria:

- 1) Trade openness and financial development have causal effects on economic growth;
- 2) Trade openness and economic growth have causal effect on financial development; and
- 3) Economic growth and financial development have causal effects on trade openness

This study is structured as follows: Section 2 introduces the theory and the literature review on the causal relationship between financial development, trade openness and economic growth. Section 3 is concerned with the econometric methodology, while Section 4 presents and discusses the findings of the study, consequently. Section 5 concludes with a summary.

## 2. Literature Review

Financial markets perform several functions which in turn exert a positive influence on growth (see Levine (1997)): they reduce liquidity and idiosyncratic risks, enhance the allocation of resources towards to their more productive uses, improve monitoring and corporate control, mobilize savings, and facilitate specialization a

*deeper* financial systems are associated with a more effective supply of these financial services to the real sector. The thesis that financial development can influence economic growth and structural change has received strong theoretical underpinnings that identify two distinct, yet complementary channels. On the one hand, it is argued that the financial sector may influence growth through the *accumulative channel* and the *allocative channel*. The accumulation channel emphasizes the finance-induced positive effects of physical and human capital accumulation on economic growth (e.g. Pagano, 1993; De Gregorio and Kim, 2000). The allocation channel focuses on the rising efficiency of resource allocation which is caused by financial deepening and which subsequently enhances growth (e.g. King and Levine, 1993).

Vamvakidis (2002) and Harrison (1996), amongst others reported openness to international trade affects economic growth positively. Openness to international trade can lead to an increase in specialization that will accelerate productivity growth by more fully realizing economies of scale. Moreover, the more open economy is expected to face more competitiveness and which stimulates productivity, which in turn stimulates economic growth

Huge empirical studies have emerged since the 1990s. Put briefly, those studies have mostly concluded that financial development positively contributes to the economic growth, although more country-specific researches are required to explain the heterogeneity across the countries. These studies can be roughly divided into two lines. While cross-country studies usually start with the *priori* assumption that finance influences growth, time series studies are largely devoted to finding the causality patterns suggested by Patrick (1966)'s hypotheses, stated that the relationship between financial development and economic growth is bidirectional, namely, supply-leading and demand-following. In addition, he argued that the direction may gradually shift from the former to the latter over time as an economy develops. We therefore review country specific study to see the direction of causality among financial development, trade openness and economic growth

Yucel (2009) examined the causality relations between financial development, trade openness and economic growth (GDP) for the Turkish economy for the period 1989 to 2007. The econometric method employed was the Johansen and Juselius cointegration and Granger causality to test for causality test among the variables. The findings of the study showed that while trade openness has a positive effect, financial development has a negative effect on growth. Moreover, the Granger causality test results revealed the presence of bi-causal relationship between financial development, trade openness and growth indicating that economic policies aimed at financial development and trade openness have a statistically significant impact on economic growth.

Hassan and Islam (2005) examined whether financial development and openness to international trade can play any positive role in reducing poverty in Bangladesh through their growth enhancing effect for the period 1974-2003. Standard Granger-causality test is employed to ascertain whether financial development and trade openness cause growth. Variables are found first difference stationary without having any co-integrating relationship as reported by Johansen co-integration test. As such Granger-causality test is carried out in first difference VAR. The paper does not find any causal relationship between trade openness and growth, and financial development and growth. This implies that financial development and trade openness do not reduce poverty through their effect on growth. However, bi-directional causal link evidenced between financial development and trade openness indicates that these two can contribute to poverty reduction directly through their mutual effect on each other.

Soukhakian (2007) empirically investigated the causal relationship between financial development, trade openness and economic growth in Japan covering the period 1960-2003. Results suggest that a long run equilibrium relationship exists between financial development, trade and economic growth in Japan except between domestic credit (second measure of financial development), trade and growth. The results of Granger Causality tests suggest that financial development as proxied by broad money gives causation to economic growth that supports the supply-leading growth hypothesis for the Japanese economy and support the growth-driven trade (GDT) hypothesis, which claims that economic growth causes "more efficient imports and exports" for Japan.

Katircioglu, Kahyalar and Benar (2007) aimed at investigating the possible co-integration and the direction of causality between financial development, international trade and economic growth in India. Annual data covering the 1965-2004 period have been used to investigate co-integration and Granger causality tests between financial development, international trade, and growth after employing unit root tests to see if the variables under consideration are stationary. Results reveal that there is a long-run equilibrium relationship between financial development, international trade and real income growth in the case of India. Furthermore, unidirectional causality was investigated that runs from real income to exports and imports, from exports to imports, M2 and

domestic credits, from M2 to imports, from imports to domestic credits. Bidirectional causality has also been obtained between real income and M2, and between real income and domestic credits. Finally, no direction of causality has been obtained between M2 and domestic credits.

Wong Hock (2005) investigated the impact of openness to international trade and financial development on economic growth in Malaysia. The empirical model in the study is based on an augmented production function, where the real GDP per capita is specified as a function of the employment, the capital, a measure of openness to international trade and financial development. The study uses different measures of financial development. The unit root test results show that on the whole all the variables are found to have a unit root. Moreover, the results of the Johansen (1988) multivariate cointegration procedure show that economic growth, the employment, the capital, a measure of openness to international trade and financial development are cointegrated. All the variables are found to have the expected signs, except the measures of financial development in Model 3 and Model 4, when data set 1970-1996 is used. ECMs are estimated. The results show openness to international trade and financial development to have a significant impact on economic growth. Generally, the results suggest that openness to international trade and financial development are important for economic growth in Malaysia. Furthermore, there is strong evidence that openness to international trade Granger causes economic growth and not vice versa. However, Granger-causality between financial development and economic growth was found to be less robust, depending on the measure of financial development.

Yanikkaya (2003) examined the impact of openness to international trade on economic growth of over 100 developed and developing countries using panel data from 1970 to 1997. The results showed that openness to international trade does not have a simple and straightforward relationship with economic growth. However, contrary to the conventional view on economic growth effects of trade barriers, the results showed that trade barriers were positively and, in most specifications, significantly associated with economic growth, particularly for developing countries and they were consistent with the findings of theoretical economic growth.

Vamvakidis (2002) examined the relationship between openness to international trade and economic growth in developed and developing countries using cross-section data over the period 1920-1990. Estimating economic growth over a long period provides useful conclusions on the robustness of openness to international trade and other explanatory variables in the empirical model. The results showed that there was no positive relationship between openness to international trade and economic growth before 1970. The relationship was found to be negative. The positive relationship between openness to international trade and economic growth was only a recent phenomenon. However, it was sensitive to the measures of openness to international trade. The finding may suggest that openness to international trade when protection in the world economy is high does not result in economic growth benefits.

Harrison (1996) examined the relationship between openness to international trade and economic growth in developing countries using cross section and panel data for the period from 1960 to 1987. The empirical estimation is based on an augmented production function. The results suggested that the choice of time period for analysis is critical, i.e., more evidence of the positive impact of openness to international trade on economic growth is found when a longer time series data is used. This may suggest the importance of analyzing the short-run and long-run impact of openness to international trade. Generally, the results were quite robust. Openness to international trade positively affects economic growth. The results of Granger-causality suggested that the causality between openness to international trade and economic growth runs in both directions, i.e. more openness to international trade precedes a higher economic growth and a higher economic growth leads to more openness to international trade.

### **3. Methodology**

The present study examines the causal relationship among financial development, trade openness and economic growth in Nigeria using annual data from 1970 to 2005. Granger-causality test in Vector Auto Regression (VAR) framework is employed to examine causal relationship among trade openness, financial development and economic growth in Nigeria. Description of data is presented first, and then procedure to examine stationarity of underlying time series is described. Next, Johansen co-integration test is described followed by Granger-causality methodology in VAR and finally the section is concluded with the discussion on stability of the estimated VAR.

#### *3.1 Overview of the variables (Data) used*

In recent years there have been different empirical works which have shown that causation runs from financial development to economic growth, that there is a bidirectional effect, or that economic growth leads to financial development, some papers have even made a case for independent causation between growth and finance. Several

indicators of financial development have been proposed in the literature. Different indicators will proxy different aspects of the relationship between the financial system and economic performance. Verifying the relationship between financial development and growth has at least two problems. First, it is necessary to assume a measure for financial development. And, secondly, many econometrics articles about this lemma do not use a theoretical model. In relation to the first problem, it will be used three variables as a proxy to financial development which includes:

- 1). Private credit as a percentage of Gross Domestic Product (GDP) (hereafter PC)
- 2). Domestic credit as a percentage of GDP (hereafter DC) and
- 3). Broad money as a percentage of GDP (hereafter M).

The sum of export and import as a percentage of GDP is used as a measure of trade openness (hereafter TO), while the Growth rate of real per capita GDP is used as the indicator of economic growth (hereafter GR). All data are taken from IFS – 2007, CD-ROM version.

### 3.2 Model Specification

The primary model showing the causal relationship among financial development, trade openness and economic growth in Nigeria can be specified thus:

$$FD_t = f(GR, TO) \text{-----} (1)$$

The function can also be represented in a log-linear econometric format thus:

$$\log FD_t = \alpha_0 + \alpha_1 \log GR_t + \alpha_2 \log TO_t + \varepsilon_t \text{-----} (2)$$

Where:

FD is financial development proxied by Direct Credit (DC), Private Credit (PC) and Money Supply (M2)

GR is Growth rate of GDP

TO is Trade Openness; and

$\alpha_0$  is the constant term, ‘t’ is the time trend, and ‘ $\varepsilon$ ’ is the random error term.

Since financial development is being proxied by three variables we separate the three variables in determining the Granger causality with Growth rate and Openness to form these three models:

$$\log DC_t = \alpha_0 + \alpha_1 \log GR_t + \alpha_2 \log TO_t + \varepsilon_{1t} \text{-----} (3.1)$$

$$\log PC_t = \beta_0 + \beta_1 \log GR_t + \beta_2 \log TO_t + \varepsilon_{2t} \text{-----} (3.2)$$

$$\log M_t = \delta_0 + \delta_1 \log GR_t + \delta_2 \log TO_t + \varepsilon_{3t} \text{-----} (3.3)$$

$\alpha_0, \beta_0$  and  $\delta_0$  are constant terms, and others are as explained above.

### 3.3 Estimation Technique

#### 3.3.1 Unit Root Test

The first step involves testing the order of integration of the individual series under consideration. Researchers have developed several procedures for the test of order of integration. The most popular ones are Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981), and the Phillip-Perron (PP) due to Phillips (1987) and Phillips and Perron (1988). Augmented Dickey-Fuller test relies on rejecting a null hypothesis of unit root (the series are non-stationary) in favor of the alternative hypotheses of stationarity. The tests are conducted with and without a deterministic trend (t) for each of the series. The general form of ADF test is estimated by the following regression

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{i=1}^n \alpha_i \Delta y_i + e_t \text{-----} (4)$$

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{n=1}^n \alpha_n \Delta y_i + \delta_t + e_t \text{-----} (5)$$

Where:

Y is a time series, t is a linear time trend,  $\Delta$  is the first difference operator,  $\alpha_0$  is a constant, n is the optimum number of lags in the dependent variable and e is the random error term; the difference between equation (1) and

(2) is that the first equation includes just drift. However, the second equation includes both drift and linear time trend pp.

$$\Delta y_t = \alpha_0 + \alpha y_{t-1} + e_t \text{-----} (6)$$

3.3.2 Co-integration test

Secondly, we test the presence or otherwise of cointegration between the series of the same order of integration through forming a cointegration equation. The basic idea behind cointegration is that if, in the long-run, two or more series move closely together, even though the series themselves are trended, the difference between them is constant. It is possible to regard these series as defining a long-run equilibrium relationship, as the difference between them is stationary (Hall and Henry, 1989). A lack of cointegration suggests that such variables have no long-run relationship: in principal they can wander arbitrarily far away from each other (Dickey et. al., 1991). We employ the maximum-likelihood test procedure established by Johansen and Juselius (1990) and Johansen (1991).

Specifically, if  $Y_t$  is a vector of n stochastic variables, then there exists a p-lag vector auto regression with Gaussian errors of the following form:

Johansen’s methodology takes its starting point in the Vector Auto regression (VAR) of order P given by

$$y_t = \mu + \Delta_1 y_{t-1} + \dots + \Delta_p y_{t-p} + \varepsilon_t \text{-----} (7)$$

Where:

$Y_t$  is an nx1 vector of variables that are integrated of order commonly denoted (1) and  $\varepsilon_t$  is an nx1 vector of innovations.

This VAR can be rewritten as

$$\Delta y_t = \mu + \eta_{y_{t-1}} + \sum_{i=1}^{p-1} \tau_i \Delta y_{t-i} + \varepsilon_t \text{-----} (8)$$

Where:

$$\Pi = \sum_{i=1}^p A_{i-1} \text{ and } \tau_i = - \sum_{j=i+1}^p A_j$$

To determine the number of co-integration vectors, Johansen (1988, 1989) and Johansen and Juselius (1990) suggested two statistic test, the first one is the trace test ( $\lambda$  trace). It tests the null hypothesis that the number of distinct cointegrating vector is less than or equal to q against a general unrestricted alternatives  $q = r$ . the test calculated as follows:

$$\lambda \text{ trace } (r) = -T \sum_{i=r+1} \ln \left( 1 - \hat{\lambda}_i \right) \text{-----} (9)$$

Where:

T is the number of usable observations, and the  $\lambda_{1,s}$  are the estimated eigenvalue from the matrix.

3.3.4 Granger-causality Test

After the testing of the Cointegration relationship, we test for causality among financial development, Trade openness and Economic Growth in Nigeria. If the variables are co-integrated, an Error Correction term (ECT) is required to be included (Granger, 1988); however, if the reverse is the case we will go ahead to test our causality using the following multivariate equation:

**MODEL 1**

$$DC_t = \sum_{i=1}^n \alpha_{11t} DC_{t-1} + \sum_{i=1}^n \alpha_{12t} TO_{t-1} + \sum_{i=1}^n \alpha_{13t} GR_{t-1} + \varepsilon_{11t} \text{-----} (10.1)$$

$$TO_t = \sum_{i=1}^n \alpha_{21t} DC_{t-1} + \sum_{i=1}^n \alpha_{22t} TO_{t-1} + \sum_{i=1}^n \alpha_{23t} GR_{t-1} + \varepsilon_{21t} \text{-----} (10.2)$$

$$GR_t = \sum_{i=1}^n \alpha_{31t} DC_{t-1} + \sum_{i=1}^n \alpha_{32t} TO_{t-1} + \sum_{i=1}^n \alpha_{33t} GR_{t-1} + \varepsilon_{31t} \text{-----} (10.3)$$

## MODEL 2

$$PC_t = \sum_{i=1}^n \beta_{11t} PC_{t-1} + \sum_{i=1}^n \beta_{12t} TO_{t-1} + \sum_{i=1}^n \beta_{13t} GR_{t-1} + \mu_{11t} \text{-----} (11.1)$$

$$TO_t = \sum_{i=1}^n \beta_{21t} PC_{t-1} + \sum_{i=1}^n \beta_{22t} TO_{t-1} + \sum_{i=1}^n \beta_{23t} GR_{t-1} + \mu_{21t} \text{-----} (11.2)$$

$$GR_t = \sum_{i=1}^n \beta_{31t} PC_{t-1} + \sum_{i=1}^n \beta_{32t} TO_{t-1} + \sum_{i=1}^n \beta_{33t} GR_{t-1} + \mu_{31t} \text{-----} (11.3)$$

## MODEL 3

$$M_t = \sum_{i=1}^n \delta_{11t} M_{t-1} + \sum_{i=1}^n \delta_{12t} TO_{t-1} + \sum_{i=1}^n \delta_{13t} GR_{t-1} + e_{11t} \text{-----} (12.1)$$

$$TO_t = \sum_{i=1}^n \delta_{21t} M_{t-1} + \sum_{i=1}^n \delta_{22t} TO_{t-1} + \sum_{i=1}^n \delta_{23t} GR_{t-1} + e_{21t} \text{-----} (12.2)$$

$$GR_t = \sum_{i=1}^n \delta_{31t} M_{t-1} + \sum_{i=1}^n \delta_{32t} TO_{t-1} + \sum_{i=1}^n \delta_{33t} GR_{t-1} + e_{31t} \text{-----} (12.3)$$

Where:

$DC_t$  is Direct Credit as a proxy financial development

$PC_t$  is Private Credit as a proxy for financial development

$M_t$  is broad Money Supply also used as a proxy for financial development

$TO_t$  is Trade Openness

$GR_t$  is Growth Rate of GDP

Rejecting (accepting)  $H_0$ ;  $\alpha_{11} = \alpha_{22} = \alpha_{33}$  in equation (10.1 to 10.3) suggests that Direct Credit do (do not) Granger cause Trade openness and Economic Growth; vice versa. Secondly, rejecting (accepting)  $H_0$ ;  $\beta_{11} = \beta_{22} = \beta_{33}$  in equation (11.1 to 11.3) suggest that Private Credit do (do not) Granger Cause Trade Openness and Economic Growth; vice versa and lastly, rejecting (accepting)  $H_0$ ;  $\delta_{31} = \delta_{32} = \delta_{33}$  indicates that Money supply do (do not) Granger cause Trade openness and Economic Growth; vice versa. These tests enable us to reveal the relationship of no causality, unidirectional causality or feedback causality among the variables used in the test.

## 4. Empirical Results

This section presents results of empirical analyses of the paper. Unit root test result is reported first followed by Johansen cointegration test result and lastly, Granger-causality test result.

### 4.1 Unit Root Test

The first step is to test whether the relevant variables in equation (2) are stationary and to determine their orders of integration. We use both the Augmented Dickey Fuller (ADF) and Phillips – Perron (PP) tests to find the existence of unit root in each of the time series. The results of both the ADF and PP tests are reported in Table 1 and 2.

The result in table 1 shows that all the variables were not stationary in levels. This can be seen by comparing the observed values (in absolute terms) of both the ADF and PP test statistics with the critical values (also in absolute terms) of the test statistics at the 1%, 5% and 10% level of significance. Result from table 1 provides strong evidence of non stationarity. Therefore, the null hypothesis is accepted and it is sufficient to conclude that there is a presence of unit root in the variables at levels. Following from the above result, all the variables were differenced once and both the ADF and PP test were conducted on them. The result is shown in table 2.

As shown in table two, the result reveals that all the variables were stationary at first difference. On the basis of this, the null hypothesis of non-stationarity is rejected and it is safe to conclude that the variables are stationary. This implies that the variables are integrated of order one, i.e.  $I(1)$ .

#### *4.2 Cointegration Result*

After confirming the stationarity of the variables at  $I(1)$ , we proceed to examine the issue of cointegration among the variables. When a cointegration relationship is present, it means that financial development, trade openness and economic growth finance, share a common trend and long-run equilibrium as suggested theoretically. We started the cointegration analysis by employing the Johansen and Juselius multivariate cointegration test. Table 3 and 4 shows the result of the cointegration test. From the result both trace statistic and maximum Eigenvalue statistic indicated no cointegration at the 5 percent level of significance, suggesting that there is no cointegrating relations between GDP, TO and the different measures of financial development.

#### *4.3 Granger Causality Test*

Having found no cointegration among the variables of financial development (DC, PC and M2), trade openness (TO) and economic growth (GR), we carried out the Granger-causality. The results are reported in Table 5, Table 6 and Table 7. Where table 5, 6 and 7 shows the results of model 1, 2 and 3, respectively.

##### **Model 1**

Our model was estimated using two lags for the variables. Granger-causality results reported in Table 5 suggest that the null hypotheses that LGR does not Granger cause LTO is rejected, which indicates that uni-directional causality runs from economic growth to trade openness. The null hypothesis that LGR does not Granger Cause LDC is rejected which shows that causality runs from Economic growth to Domestic credit. Lastly, the null hypothesis that LTO does not Granger cause LDC is rejected, which consequently means that LTO Granger causes LDC.

##### **Model 2**

Granger-causality results reported in Table 6 shows that the null hypothesis that LGR does not Granger causes LPC is rejected, which indicates causality running from Economic growth to Private credit. The null hypothesis that LTO does not Granger Cause LPC is rejected which indicates that Uni-directional causality runs from Trade openness to Private credit.

##### **Model 3**

Granger-causality results reported in Table 7 indicates that the null hypotheses that LGR does not Granger cause LM2 is rejected, which indicates causality from Economic Growth to Money supply. The null hypothesis which states that LM2 does not Granger Causes LTO is rejected which implies a uni-directional causality running from Money supply to Trade openness.

## **5. Conclusion**

The purpose of this study is to examine the causal relationship among financial development, trade openness and Economic Growth in Nigeria using annual data sourced from IFS-2007, CD-ROM version for the period 1970-2005. The econometric methodology employed was the Cointegration and Granger Causality test. First, the stationarity properties of the data and the order of integration of the data were tested using both the Augmented Dickey-Fuller (ADF) test and the Phillip-Perron (PP) test. We found that the variables were non-stationary in levels, but stationary in first differences, that is, they are integrated of order one  $I(1)$ . We applied the Johansen multivariate approach to cointegration to test for the long-run relationship among the variables. Our result shows that there are no cointegrating relations between GR, TO and the three measures of financial development (DC, PC and M2), suggesting that there is no long-run relationship between financial development, trade openness and economic growth. In absence of cointegration, Granger causality test is carried out with two lag length.

The Granger-causality results suggest that trade openness and financial development does have causal impact on economic growth; conversely growth does have causal impact on trade and financial development. As noted, growth was found to have causal effect on trade openness implying support for growth-led trade but no support for trade-led growth; this follows the findings of Soukhakian (2007), in Japan. Domestic credit, Private credit and broad money, as a percentage of GDP have no causal impact on economic growth rather economic growth was seen to necessitate these credits and the supply of money. On the other hand, Money supply was the only instrument of financial development that was seen to cause Trade openness; which means that it was rather trade openness that was found to cause both Direct credit and Private credit as measures of financial development.

**Implications:**

The findings of the study shows that trade and financial development do have positive effect on economic growth due the causal impact they both have on the growth of GDP. Also, economic growth revealed a direct impact on enhancing the performance of the financial sector performance as well as increasing the strength of Nigeria participating in international trade (openness). If this is seriously considered by policy makers, its pertinent that policies enhance growth-led trade be seriously pursued for Nigeria to participate and benefit effectively from international trade. Furthermore, to enhance and guarantee the availability of Domestic credit, private credit and money supply, effort should be made to take on measures that lead to GDP growth through other measures including trade openness.

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### Appendices

Table 1. Unit Root test for Stationarity at Levels

Variables	ADF (Intercept)	ADF (Intercept and Trend)	PP (Intercept)	PP (Intercept and Trend)
LTO	-2.468(-3.632)*	-3.266(-4.243)*	-2.330(-3.632)*	-3.260(-4.243)*
LDC	-2.468(-3.646)*	-2.762(-4.284)*	-1.584(-3.646)*	-3.458(-4.262)*
LPC	0.120(-3.632)*	-1.587(-4.243)*	0.068(-3.632)*	-1.834(-4.243)*
LGR	0.401(-3.632)*	-1.383(-4.243)*	0.353(-3.632)*	-1.531(-4.243)*
LM2	-0.734(-3.639)*	-2.568(-4.252)*	-0.237(-3.632)*	-1.955(-4.243)*

**Note:** Significance at 1% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

**Source:** Author's Estimation using Eviews 6.0.

Table 2. Unit Root test for Stationarity at First difference

Variables	ADF (Intercept)	ADF (Intercept and Trend)	PP (Intercept)	PP (Intercept and Trend)
LTO	-8.647(-3.639)*	-8.512(-4.252)*	-8.965(-3.639)*	-8.815(-4.252)*
LDC	-4.616(-3.661)*	-4.527(-4.284)*	-7.666(-3.661)*	-7.991(-4.284)*
LPC	-5.092(-3.639)*	-5.026(-4.252)*	-5.087(-3.639)*	-5.021(-4.252)*
LGR	-4.984(-3.639)*	-4.965(-4.252)*	-4.984(-3.639)*	-4.971(-4.252)*
LM2	-3.856(-3.639)*	-3.797(-3.548)**	-3.887(-3.639)*	-3.824(-3.548)**

**Note:** 1. \* and \*\* indicates significant at 1% and 5% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

**Source:** Author's Estimation using Eviews 6.0.

Table 3. Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.568364	66.86719	69.81889	0.0841
At most 1	0.456971	38.30130	47.85613	0.2890
At most 2	0.273716	17.54112	29.79707	0.6000
At most 3	0.174950	6.667420	15.49471	0.6166
At most 4	0.003782	0.128832	3.841466	0.7196

Trace test indicates no cointegration at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 4. Unrestricted Cointegration Rank Test(Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.568364	28.56589	33.87687	0.1886
At most 1	0.456971	20.76018	27.58434	0.2910
At most 2	0.273716	10.87370	21.13162	0.6599
At most 3	0.174950	6.538588	14.26460	0.5451
At most 4	0.003782	0.128832	3.841466	0.7196

Max-eigenvalue test indicates no cointegration at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Table 5. Pair-wise Granger Causality test between LTO, LGR and LDC

Null Hypothesis:	Obs	F-Statistic	Probability
LTO does not Granger Cause LGR	34	0.17072	0.84390
LGR does not Granger Cause LTO		2.21125	0.12770
LDC does not Granger Cause LGR	34	0.77802	0.46867
LGR does not Granger Cause LDC		2.82835	0.07548
LDC does not Granger Cause LTO	34	0.63249	0.53844
LTO does not Granger Cause LDC		1.23403	0.30595

Table 6. Pair-wise Granger Causality test between LTO, LGR and LPC

Null Hypothesis:	Obs	F-Statistic	Probability
LTO does not Granger Cause LGR	34	0.17072	0.84390
LGR does not Granger Cause LTO		2.21125	0.12770
LPC does not Granger Cause LGR	34	0.51798	0.60113
LGR does not Granger Cause LPC		4.67138	0.01743
LPC does not Granger Cause LTO	34	1.46953	0.24666
LTO does not Granger Cause LPC		2.94258	0.06862

Table 7. Pair-wise Granger Causality test between LTO, LGR and LM2

Null Hypothesis:	Obs	F-Statistic	Probability
LTO does not Granger Cause LGR	34	0.17072	0.84390
LGR does not Granger Cause LTO		2.21125	0.12770
LM2 does not Granger Cause LGR	34	0.24638	0.78324
LGR does not Granger Cause LM2		3.12757	0.05889
LM2 does not Granger Cause LTO	34	1.11361	0.34201
LTO does not Granger Cause LM2		0.35856	0.70174