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# ARDL Approach to Trade Libralisation and Economic Growth in the Developing Country: Evidence from Nigeria

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**Abstract**

This study examined the trade impact of trade liberalization in the developing economies from 1981 to 2014. It employed the Autoregressive Distributed Lag (ARDL) bound test approach. Two measures of trade liberalization were used to form an index of trade openness, while three measures of financial sector development were used to construct index of financial development using principal component analysis. The result suggested that the long run impact of trade liberalization on the economic growth of Nigerian is found to be negatively significant. The short run impact of trade liberalization on economic growth was found to be positive and significant. In total, the long and short run impact of trade liberalization to economic growth suggested that the Nigeria economy is yet to harness the benefits of international trade. It was also suggested that trade liberalization could enhance economic growth. However, the introduction of other variables in the likes of financial development, labour force and gross capital formation, none played a significant impact on economic growth in the Nigeria. The findings of this study offer some important policy implications. Trade liberalization could be another avenue for economic diversification through foreign direct investment and by so doing there will be improved in gross capital formation and

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indeed economic growth. Nigeria also needs to create diversified, dynamic and competitive sectors capable of absorbing the more educated labour force to translate human capital to higher economic growth

**Key Words**: Trade liberalization, Economic growth, Labour force, gdpc, ARDL, cointegration

## Introduction

The new interest in the determinants of economic growth has revived the discussion among scholars on trade liberalization and growth. Theoretically, trade and growth generally predict a positive relationship between openness to international trade and economic growth. There are a number of channels through which openness is thought to influence economic growth. In the first place, a liberal trade regime enhances efficiency through greater competition and improved resource allocation. Secondly, greater access to international markets paves ways for economies to overcome size limitations and benefit from economies of scale. Thirdly, imports of capital and intermediate goods can contribute to the growth process by enlarging the productive capacity of the economy. Fourthly, trade can lead to productivity gains through international diffusion and adoption of new technologies. However, these channels have not reduced the increasing debate in this area of study since the theoretical literature does not provide a clear answer, empirical work is needed to help resolve the debate.

Empirical studies on the relationship between openness and economic growth have largely supported the view that openness has a favourable impact on economic growth. It is not surprising, then, that the proposition that more open economies tend to grow faster has gained wide acceptance in academic as well as policy circles. This study on openness and growth relations reveals three important considerations. First, many studies use cross-country, cross-industry data for LDCs. However, little has been studied on the impact of openness at a country level. Accordingly, this study differs importantly from others in the literature by using time-series data for a developing country to examine the dynamics of openness–growth relations. The dynamics are examined through computation of recent econometric methodology in the like of ARDL and VECM. Second, many cross-sectional studies employ various measures of openness to find the relationships with economic growth, but it is difficult to obtain long historical time-series data for the openness measures. Readily available are time-series data for exports and imports. In particular, the imports/GDP ratio that is used as an openness measure in the cross-country literature (Romer, 1993) may also represent in time series how much the degree of openness to trade changes over time.

As a result of the increasing concern academics, policy makers, and practitioners place on trade trade liberalization as drivers of the process of economic growth. A thorough understanding of their linking mechanisms requires inquiring about both the short and

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long run effects of trade liberalization on output growth. Introducing cobb-douglas production function and ARDL technique, this study seeks to uncover the long run and short run relationship between economic growth and trade liberalization in Nigeria. By examining the effect of trade liberalization on economic growth, this study contributes to a number of studies that have explored trade openness on economic growth (See Feenstra (1996), Grossman and Helpman (1991) and Srinivasan (2001), Rodrik (2001. Hye (2012). Our finding is not in line with the result of Hoque and Yusop (2010))

**Theoretical Underpinning**

The relationship between trade liberalization and economic growth has been examined extensively in the research arena. To start with, the standard trade theory demonstrates the static gains from trade through competition and specialisation according to comparative advantage. While these gains are captured in terms of the level of productivity, these can be transmitted into growth effects as economies adjust to new equilibrium as a result of opening up to international trade. At the forefront of this study is Romer (1986) and Lucas (1988) Krugman, 1979; Dixit and Norman, 1980; and Lancaster, 1980, see (Aghion & Howitt, 1998; Ben-David & Loewy, 1998; Edwards, 1993; Grossman & Helpman, 1991; Keller, 2002; Romer, 1990 among other) who posited that technological change can be influenced by a country's trade libralization leading to productivity gains and economic growth.

Going back in time, trade liberalization and economic growth can be traced to the fundamental economists in the likes of Adam Smith and David Ricardo who postulated that world output would grow when countries undertake the division of labour based on absolute advantage (Smith) and comparative advantage (Ricardo). The neoclassical trade theory suggests the link mechanism between trade liberalization and economic growth is centred on the fact that trade stimulates economic growth through the production, consumption, and savings linkages. The rule of thumb according to this theory expects the production for export of goods and services to stimulate production in other industries through the backward and forward linkages. In the case of consumption linkages, Deme (2002) posited that increased income in the export sector can raise demand for domestic goods thereby stimulating production. With respect to the savings linkages, the theory suggests that a rise in export earnings increases savings and thus capital formation thereby raising the productive capacity of the economy. A more recent trade theory (Krugman, 1979; Dixit and Norman, 1980; and Lancaster, 1980) emphasized the impact of economies of scale on international trade. It was theorized that countries achieve productivity gains when they start producing on a larger scale for the international market. Another theory argueed that trade can advance economic growth through capacity utilization (Krueger, 1988). This latter theory suggested that when countries begin producing for the larger (international) market they tend to use the idle capacity thereby increasing domestic production. Each of the

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above theories basically supports the export-led growth hypothesis. However, while there is a plethora of economic analysis regarding the export-led growth hypothesis, the concept of the import-led growth hypothesis is practically overlooked. This is despite the fact that for many countries a large proportion of imports consist vital raw materials, as well as intermediate and capital goods; a disruption in the flow of these resources can impose a severe adverse impact economic growth. Imports also advance economic growth through the transfer of technology embodied in imported goods as well as the imitation of it. Furthermore, the intense competition fostered by international market may force some industries to improve efficiency and accordingly raise productivity. Herwartz and Walle (2014) argued that trade openness may lead to enhanced macroeconomic efficiency by providing access to new raw materials and products, low-cost intermediate goods, larger markets and latest technologies. (Yanikkaya, 2003). The increased efficiency—both at the firm and the aggregate level—likely leads to efficient utilization of funds channeled by domestic financial intermediaries. Hence, openness could strengthen the positive impact of financial development on growth.

**Empirical Review**

A good number of empirical studies have attempted to analyse the relationship between trade liberalization and economic growth, the general consensus among scholars are that open economies grow faster than close or restrictive economies see (Aghion & Howitt, 1998; Ben-David & Loewy, 1998; Edwards, 1993; Grossman & Helpman, 1991; Keller, 2002; Romer, 1990) name but a few. The underlining assumption of this argument is the existence of both static and dynamic gains of trade reform (freer trade) affecting per capita income positively. The gains of trade, however, work their way into output growth through somehow different forces and mechanisms depending on whether the gains are short term or long term related. Thus, consensus rests on the assumption that open trade induces economic that boosts productivity through two forces. First, in the short run, trade promotes the reduction of resource use misallocation – along the lines of a comparative advantage specialization – and, secondly, in the long run through the transfer of off-the-shelves technological development – knowledge development and accumulation (see Ben-David & Loewy, 1998; Edwards, 1993; Harrison, 1996; Keller, 2002; among others). In the latter case, the dynamic gains deriving from increased trade could allow for the generation of economies of scale, learning by doing (know-how and experience effects), and overall development of the R&D sector (Aghion & Howitt, 1998; Ben-David & Loewy, 1998; Grossman & Helpman, 1991; Romer, 1986, 1990, 1994) resulting in sustained levels of output growth in the long run. However, it is relevant to note that short term gains are not necessarily a sine-qua-non-condition leading to long term efficiency gains. On a related issue, Krammer (2010) notes that the gains of increased trade on output growth are conditioned to the portfolio of trade.

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In addition, Oladipo (2011) realized relationship between trade liberalization, investment, human capital and economic growth using Mexican data. The results indicated cointegration between the variables and trade liberalization, investment and human capital have positive and significant effect on economic growth over study period. Moreover, Sakyi (2011) scrutinized the relationship between trade and growth by incorporating foreign aid as an additional variable in the case of Ghana in post-liberalization regime and found that trade and foreign aid inflows contribute to economic growth both in long and short runs.

In the case of Pakistan, Din et al. (2003) found bidirectional causality between trade and economic growth and, Siddiqui and Iqbal (2005) found no causal relationship between both the variables. Din (2004) also examined causality association between exports, imports and economic growth. After finding cointegration between these variables, Din documented no causality between exports and economic growth while growth-led-imports hypothesis existed in the case of Pakistan. Dutta and Ahmed (2004) investigated the trade-growth nexus using endogenous growth theory. They reported that trade liberalization has positive effect on industrial growth while capital stock and labor also contribute in enhancing the productivity of industrial sector. Chaudhary et al. (2010) analyzed relationship between trade liberalization and economic growth by incorporating human capital as potential input in production function. Their results showed that trade openness and human capital play a vital role to sustain economic growth supporting growth theories incorporated in economic literature.

Researching further, most recent studies that we reviewed so far posit that trade liberalisation had a positive impact on economic growth Krammer (2010), Keller, (2002). However, there are a large number of studies that produced negative or inconclusive results. Feenstra (1996), who indicated that in the absence of international spillovers, free trade may lead to a decline in the growth rates of smaller countries (where size is measured by the labor force in R&D efficiency units). The possibility that openness can lead to a decrease in growth is an intriguing situation. Grossman and Helpman (1991) and Srinivasan (2001), the endogenous growth model suggested that trade may be growth retarding. They argued that trade openness exposes developing countries to volatility of output and terms of trade. Rodriguez and Rodrik (2001) argued that the measures of trade openness used in many studies showing positive links between trade liberalization and exports are flawed. They further posited that if the magnitude of shocks is beyond the absorptive capacity of the country, the forces of dynamic comparative advantage push the economy away from the direction of activities that stimulate long run economic growth. Romer also stipulated that a negatively linked with economic growth could be linked with imbalanced between the local resources of the country and the technology generated by the trade openness. Hye (2012) employed JJ cointegration, autoregressive distributed lag (ARDL) approach to cointegration, dynamic OLS, variance decomposition, and principal component

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analysis (PCA) in case of Pakistan to test the link between trade openness and economic growth. His empirical results indicate a negative association between trade openness and economic growth.

Edwards (1992) used an openness measure that was the difference between actual and predicted trade; the predicted trade volume was obtained from a theoretical model that did not impose tariffs and trade barriers. Edwards found a positive and significant effect of openness on GDP growth. Dollar (1992) further investigated the output effects of openness using real exchange rate distortions and fluctuations, and the findings of a negative association between the exchange rate distortions and output growth appeared to be consistent with the proposition in new growth theories. To check on the robustness of the results, Levine and Renelt (1992) employed six different measures of trade policies, but direct output effects of openness were difficult to find, while indirect output effects through investment were observed to be significant. Employing several openness measures, Harrison (1996) used a panel data for LDCs, but robust positive relations were again difficult to find. Using similar proxies for openness, Edwards (1998) attempted to address these deficiencies with a comparative dataset from 93 countries, to measure the relationship between trade liberalisation and productivity growth. Using the instrumental weighted least squares method of estimation, his results showed that there was a robust relationship between trade liberalisation indicators and TFP growth.

Hoque and Yusop (2010) examined the impact of trade liberalisation on the aggregate import in Bangladesh, using the ARDL Bounds Test approach with annual time series data from 1972–1973 to 2004–2005. Their results suggested that trade liberalisation through reduction of the import duty rate increases the aggregate import substantially in the short run, but insignificantly in the long run. Liberalisation interaction with price decreases imports slightly hence improves the trade balance, while interaction with income increases imports slightly hence worsens the trade balance. An increase in imports is mainly stimulated by an increase in income. Moreover, higher income elasticity compared to price elasticity indicates that an effort to maintain imports at the desired level by increasing import duty could be counter balanced and ineffective

Another point of interest is the interaction between foreign and local investment as a result trade liberalization. Openness, however, does not raise economic growth unambiguously. Levine and Renelt (1992) suggested that openness and growth relations occur through changes in investment, and increasing openness may stimulate foreign direct investment from abroad; but at the same time, domestic investment may shrink due to a keen competition with foreign investment. In this case, the output effect of the two driving forces is ambiguous, depending on the size of changes in domestic and foreign investment. Grossman and Helpman (1991) further indicated that government protection, rather than openness, may raise the long-run growth if

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government intervention in international trade encourages domestic investment along the lines of comparative advantages.

According to Musleh-ud Din, Ejaz Ghani, and Omer Siddique (2003), there is evidence of a long-run equilibrium relationship between openness and economic growth. An error-correction model is estimated to investigate the short-run as well as long-run causal patterns. The results indicate the absence of causality between openness and economic growth in the short run. This suggests that short-run variations in openness and growth rates may be dominated by business cycle fluctuations with no clear causal pattern in the short run. However, the evidence of bidirectional causality between openness and economic growth in the long-run indicates that both openness and economic growth reinforce each other in a longer-term perspective.

A common feature of the above studies is their reliance on estimations based on cross-country growth averages of diverse groups of economies which differ in terms of their socio-economic characteristics, institutions, and policies. Since individual country experiences can be quite different, these studies are unable to identify country-specific parameters in the openness growth nexus. Consequently, a number of studies have focused on individual country experiences based on time series data. A common feature of most of the earlier studies is that most relied on international cross sectional evidence. One important limitation of the method is the assumption that the coefficients of parameter estimates are similar across countries which may not be true for some countries chosen in the sample (Edwards, 1993). Also, some paid little attention to the time series properties of the data.

**Table 1:** Studies showing relation between trade liberalization and economic growth in developing countries using the framework of an endogenous growth model.

| Authors | Methodology | Findings |
|---|---|---|
| Romer (1989) | Time-series data for 1960–1985 for 90 developing countries; regression analysis. | Testing the significance of an endogenous growth model, the study finds that economic openness, by taking advantage of a wider range of innovations, increases the growth rate. |
| Edwards (1992) | Time-series data for 1970–1982 for 30 developing countries; regression analysis | Trade orientation and human capital accumulation emerge as significant determinants of growth in developing countries. |
| Villanueva (1994) | Time-series data for 1975–1986 for 36 developing countries; regression analysis | The empirical results validate the endogenous growth model, particularly the positive effects of public policies of openness and investment in human capital on growth. |

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| | | |
|---|---|---|
| Ghatak et al., (1995) | Time-series data for 1950–1990 for the Turkish economy; cointegration analysis | A stable long-run relationship exists among real GDP per capita, an index of trade liberalization, and human and physical capital. |
| Gould and Ruffin (1995) | Time-series data for 1960–1988 for 98 countries; regression analysis | A positive relation between growth and the external effects of human capital varies according to trade regimes, with growth rates ranging from 0.65% to 1.72% higher in open economies than closed ones. |
| Ahmed (1999) | Time series data for 1974:1–1996:4 for the Bangladesh economy; cointegration analysis | The empirical results validate the endogenous growth model developed by Lucas (1988), showing the positive effect of trade liberalization and investment in human capital on industrial growth. |

**Source: Ahmed (1999)**

## Data and Methodology

### Data Description

This study used annual data covering the period of 1981 to 2014. Trade liberalization is measured by the degree of trade openness of the Nigeria economy. It is captured by using the ratio of total trade (exports plus import) to GDP. Real Gross Domestic Product per capita represents the economic growth of Nigeria. It is derived by dividing the real GDP by total population. It captured economic growth of Nigeria 'from 1981-2014. To capture the financial development, the current study employed three widely indicators: credit to private sector by deposit money bank (% GDP) which excludes credit issued to the public sector (government agencies and public enterprises), the ratio of liquid liability of bank and non-bank financial development to GDP and deposit money bank assets to GDP. The volume of domestic credit to private by deposit money banks relative to the size of the Nigerian economy measured the contribution of financial depth in the private sector activities. The ratio of liabilities to GDP measured the size of the financial development relative to the size of the Nigeria economy and the ability of financial activities to meet unanticipated demand to withdraw deposits by customers (see Naceur et el., 2014) while the ratio of deposit money bank asset to GDP captured the overall size of the banking sector relative to the size of the economy. Gross capital formation represented the rate of domestic investment. It is derived by dividing gross fixed capital formation by total population. It captured the rate of domestic. Labor force represents the labour force in Nigeria between the ages of 18-65 years

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**Table 2:** List of variables

| Variable | Definition | Source |
|---|---|---|
| RGDPC | GDP per capita (LCU) | World development indicator database, world bank (online) |
| CPS | Domestic credit to private sector over GDP | Beck et el (2012) financial development structure dataset. 2015 undated version |
| LIQ | Liquidity liability (M3) over GDP | Beck et el (2012) financial development structure dataset. 2015 undated version |
| BA | Deposit money bank assets to GDP | Beck et el (2012) financial development structure dataset. 2015 undated version |
| FDindex | Financial development composite index constructed using CPS, LIQ, BA | Beck et el (2012) financial development structure dataset. 2015 undated version |
| OPEN | Trade openness: total trade (export plus imports) over GDP | World development indicator database, world bank (online) |
| gfcf | Represents the rate of domestic investment. It captures the rate of domestic. | World Development Indicators database, World Bank (Online) |
| pop | It represents the labour force in Nigeria between the age of 18-65 years | World Development Indicators database, World Bank (Online) |

**Source:** Author's Design.

We use the three indicators of financial development to construct the overall composite index *fidindex*. Given that none of the indicators could be regarded as the best or overall measure of financial development and the high correlation between the indicators (see table 2), a composite index is constructed from these indicators using principal component analysis (PCA). Principal component analysis (PCA) has commonly been used to address the problem of multicollinearity by reducing a large set of correlated variables into a smaller set of uncorrelated variables (see Stock & Watson, 2002), and has been widely employed in the construction of financial development in recent studies. Table 3, shows that the first principal component accounts for about 89.66% of the total variation in the three financial development indicators. In spirit with Aug and Mckibbin (2007), the individual contributions of pcrd, liq and dmb to be standardized variance of the first principal component (eignvector of PC1)

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**Table 3:** Correlation matrix and principal component analysis

Eigenvalues: (Sum = 3, Average = 1)

| Number | Value | Difference | Proportion | Cumulative Value | Cumulative Proportion |
|---|---|---|---|---|---|
| 1 | 2.689899 | 2.432610 | 0.8966 | 2.689899 | 0.8966 |
| 2 | 0.257289 | 0.204477 | 0.0858 | 2.947188 | 0.9824 |
| 3 | 0.052812 | -- | 0.0176 | 3.000000 | 1.0000 |

Eigenvectors (loadings):

| Variable | PC 1 | PC 2 | PC 3 |
|---|---|---|---|
| PCRD | 0.578899 | -0.556992 | 0.595513 |
| LIQ | 0.555943 | 0.803877 | 0.211445 |
| DMB | 0.596493 | -0.208666 | -0.775019 |

Ordinary correlations:

| | PCRD | LIQ | DMB |
|---|---|---|---|
| PCRD | 1.000000 | | |
| LIQ | 0.757151 | 1.000000 | |
| DMB | 0.934375 | 0.840201 | 1.000000 |

**Source: eviews9**

**Model Specification**

In spirit with Gould and Ruffin (1995), Ahmed (1999), Rivera-batiz (2004), Ghatak et al., (1995) and N'Zue (2011), the author considers a Cobb-Douglas production function which is specified as follows;

$$Y = AL^{\alpha}K^{\beta} \quad (1)$$

Where Y is economic growth measured by real GDP per capita, K is the capital stock measured by gross fixed capital formation and A is the total factor productivity, α determines the share of output that goes to capital and the share that goes to labour. Assuming the author augment the neoclassical Cobb-Douglas production by incorporating financial development, trade openness as:

$$\mathrm{A} = \mathrm{f(financial\ development\ and\ tarde\ openness)}.$$

$$\mathrm{rgdpc} = \mathrm{f(gcfr, pop, fidindex, open)} \quad (2)$$

The above equation can be written in econometric model and in their respective natural log form as thus;

$$\mathrm{lnrgdpc} = \alpha_0 + \beta_1\mathrm{lngcfr} + \beta_2\mathrm{pop} + \beta_3\mathrm{lnfdindex} + \beta_4\mathrm{lnopen} + \varepsilon_t \quad (3)$$

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Where lnrgdpc is log of real gdp per capita, lnpop is log of labor force, lnfdindex is log of financial development, lnopen is the log of trade openess, $\varepsilon_t$ is the error term and $\alpha_0$ is the intercept.

## Methodology

### Unit root Test

In time series analysis, before running the cointegration test the variables must be tested for stationarity. For this purpose, we use the conventional ADF tests, the Phillips–Perron test following Phillips and Perron (1988). The ARDL bounds test is based on the assumption that the variables are I(0) or I(1). Therefore, before applying this test, we determine the order of integration of all variables using unit root tests by testing for null hypothesis $H_o: \beta = 0$ (i.e $\beta$ has a unit root), and the alternative hypothesis is $H_1: \beta < 0$ . The objective is all variables should not be I(2) so as to avoid spurious results. In the presence of variables integrated of order two we cannot interpret the values of F statistics provided by Pesaran et al. (2001) or it will go boasted.

### Cointegration Approach

In order to empirically analyse the long-run relationships and short-run relationship between real wage, inflation and production, this study apply the autoregressive distributed lag (ARDL) cointegration technique as a general vector autoregressive (VAR).

The ARDL cointegration approach was developed by Pesaran and Shin (1999) and Pesaran et al. (2001). This approach enjoys several advantages over the traditional cointegration technique documented by (Johansen and Juseline, 1990). Firstly, it requires small sample size. Two set of critical values are provided, low and upper value bounds for all classification of explanatory variables into pure I (1), purely I(0) or mutually cointegrated. Indeed, these critical values are generated for various sample sizes. However, Narayan (2005) argues that existing critical values of large sample sizes cannot be employed for small sample sizes. Secondly, Johensen's procedure require that the variables should be integrated of the same order, whereas ARDL approach does not require variable to be of the same order. Thirdly, ARDL approach provides unbiased long-run estimates with valid t'statistics if some of the model repressors are endogenous (Narayan 2005 & Odhiambo, 2008). Fourthly, this approach provides a method of assessing the short run and long run effects of one variables on the other and as well separate both once an appropriate choice of the order of the ARDL model is made, (see Bentzen and Engslted, 2001). In this regard, Pesaran and Shin, (1999) explain that AIC and SC perform well in small sample, but SC is relatively superior to AIC. The ARDL model is written as follow;

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$$\Delta lnrgpc_t = \alpha_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnrgdpc_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta lngfcf_{1_{t-1}} + \sum_{i=0}^{n} \beta_{3i} \Delta lnpop_{2_{t-1}} + \sum_{i=0}^{n} \beta_{4i} \Delta lnfdindex_{3_{t-1}} + \sum_{i=0}^{n} \beta_{5i} \Delta lnopen_{4_{t-1}} + \beta_5 lnrgdpc_{t-1} + \beta_6 lngfcf_{t-1} + \beta_7 lnpop_{t-1} + \beta_8 lnlnfdindex_{t-1} + \beta_9 lnopen_{t-1} + \varepsilon_t \quad (4)$$

Where $\Delta$ is the difference operator while $\varepsilon_t$ is white noise or error term. The bounds test is mainly based on the joint F-statistic whose asymptotic distribution is non-standard under the null hypothesis of no cointegration. The first step in the ARDL bounds approach is to estimate the four equations (4) by ordinary least squares (OLS). The estimation of this equation tests for the existence of a long-run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables. The null hypothesis of no co-integration and the alternative hypothesis which are presented in (Table 4) below as thus:

**Table 4**

| null hypothesis of no co-integration | alternative hypothesis | Equation |
|---|---|---|
| $H_0: \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$ | $H_1: \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq \beta_9 \neq 0$ | 4 |

**Source:** Author's design

Note all the variables defined previously.

Two sets of critical values for a given significance level can be determined (Narayan 2005). The first level is calculated on the assumption that all variables included in the ARDL model are integrated of order zero, while the second one is calculated on the assumption that the variables are integrated of order one. The null hypothesis of no cointegration is rejected when the value of the test statistic exceeds the upper critical bounds value, while it is not rejected if the F-statistic is lower than the lower bounds value. Otherwise, the cointegration test is inconclusive. In the spirit of Odhiambo (2009) and Narayan and Smyth (2008), we obtained the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. The equation, where the null hypothesis of no cointegration is rejected, is estimated with an error-correction term (Narayan and Smyth, 2006; Morley, 2006). The vector error correction model is specified as follows:

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$$\Delta lnrgdpc_t = \alpha_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnrgdpc_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta lngfcf_{1_{t-1}} + \sum_{i=0}^{n} \beta_{3i} \Delta lnpop_{2_{t-1}} + \sum_{i=0}^{n} \beta_{4i} \Delta lnfdindex_{3_{t-1}} + \sum_{i=0}^{n} \beta_{5i} \Delta lnopen_{4_{t-1}} + \lambda_1 ECM_{t-1} + \mu_{1t} \quad (5)$$

$ECM_{t-1}$ is the error correction term obtained from the cointegration model. The error coefficients $(\lambda_1)$ indicates the rate at which the cointegration model corrects its previous period's disequilibrium or speed of adjustment to restore the long run equilibrium relationship. A negative and significant $ECM_{t-1}$ coefficient implies that any short run movement between the dependant and explanatory variables will converge back to the long run relationship.

**Stability and Diagnostic test**

To ensure the goodness of fit of the model, diagnostic and stability tests are conducted. Diagnostic tests examine the model for serial correlation, functional form, non-normality and heteroscedasticity. The stability test is conducted by employing the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) suggested by Brown et al. (1975). The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the break points. If the plots of the CUSUM and CUSUMSQ statistics stay within the critical bonds of a 5 percent level of significance, the null hypothesis of all coefficients in the given regression is stable and cannot be rejected.

**Presentation of Empirical Results**

**Descriptive Statistics and Graphical Analysis**

Table 3 presents the mean, median, maximum and minimum values and standard deviation for the variables used in this study. OPEN is used to capture the level trade openness, FDindex as a variable that also affects real gdpc and at the same time promotes trade liberalization. Labor force (LAB) and gross fixed capital formation (gfcf) are endogenously determined from the standard cobb-douglas production over the period of 1981 to 2014. The average trade openness over the year is N0.484 with maximum price of N4.265 and a minimum price of N-1.840. The standard deviation 1.811 is significant higher than the standard deviation of the other variables. Figure 1 explains the trends in the other variables in Nigeria over the period of 1981 to 2014.

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Figure 1 shows gradual decrease in real gdpc from 1981 to 1987 and relatively unchanged up until 2002.There is a drastic upward movement from 2003 which could be as a result various policy formulations that created positive impact among the masses. There is a continuous decrease in the trade openness. The gross fixed capital formation had been inconsistence over the period of research, and has its lowest point in 2005. The movement in all the variables have witness a movement due to poor trade liberalization evince from the steep decrease in the variable.

**Table 5:** summary of descriptive statistics

| | LRGDPC | LFDINDEX | LOPEN | LLAB | LGFCF |
|---|---|---|---|---|---|
| Mean | 12.36577 | 3.466281 | 0.484757 | 3.969572 | 2.440962 |
| Median | 12.24791 | 3.398537 | -0.324852 | 3.973302 | 2.478056 |
| Maximum | 12.85585 | 4.237944 | 4.265402 | 3.983345 | 3.561650 |
| Minimum | 12.05759 | 2.933380 | -1.840978 | 3.950907 | 1.697265 |
| Std. Dev. | 0.253208 | 0.297260 | 1.811918 | 0.011026 | 0.426666 |
| Skewness | 0.710740 | 0.594127 | 0.680414 | -0.363160 | 0.677277 |
| Kurtosis | 1.960201 | 2.937753 | 2.170239 | 1.677169 | 3.436902 |

**Source:** eviews9

**Figure 1:** Time evoluation of the selected variables in the study

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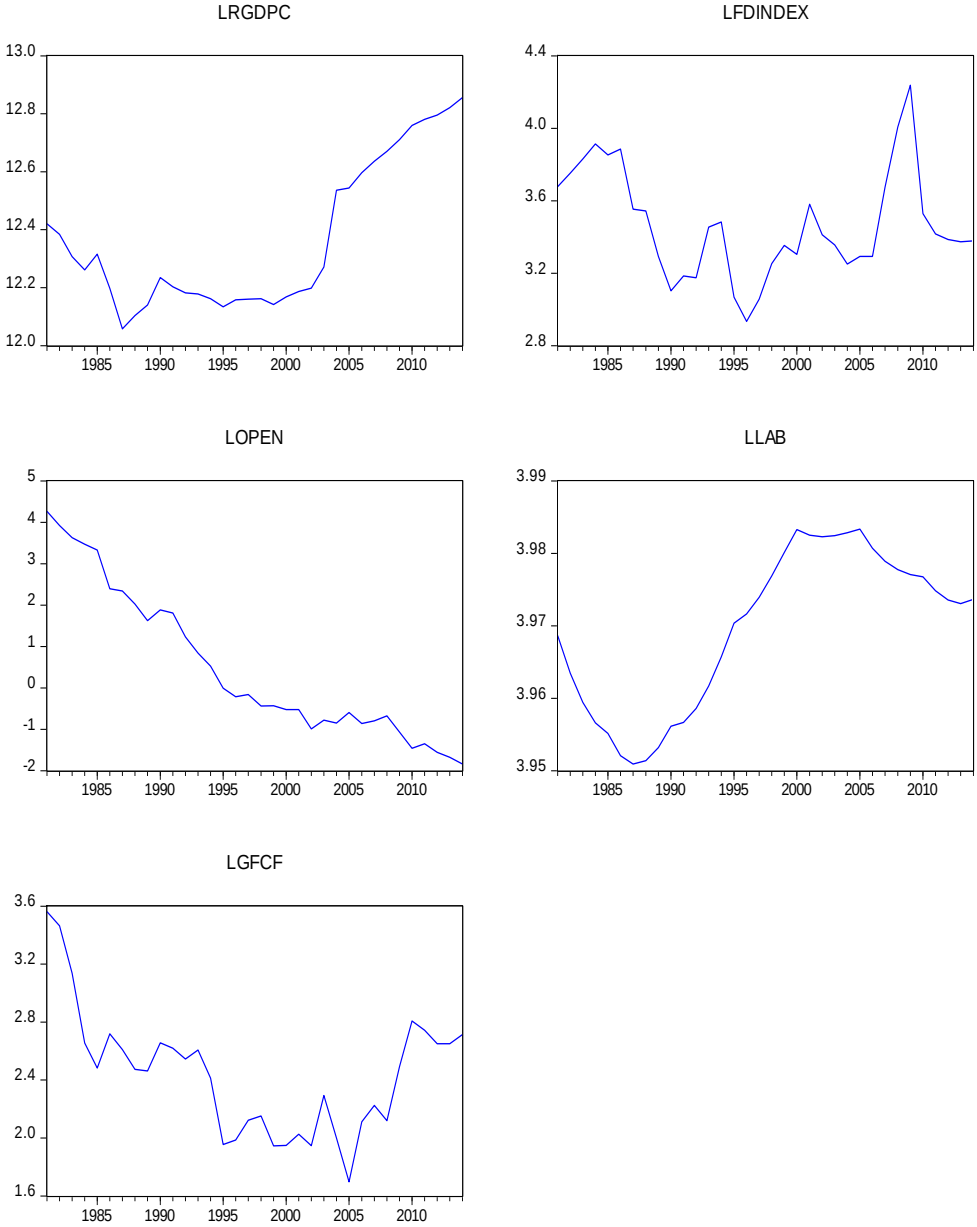


**Source:** eviews9

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**Table 6: Unit root test**

| | ADF | PP | ADF | PP |
|---|---|---|---|---|
| variables | In level 1(0) | | First difference I(1) | |
| lnrgdpc | 0.5355 | 0.2542 | -4.2583*** | -4.2436*** |
| lnopen | -2.2849 | -2.4652 | -6.0069*** | -5.9940*** |
| lnfdindex | -2.7595* | -2.0930 | -4.2874*** | -5.4822*** |
| lngfcf | -1.6000 | -2.8496 | -3.2690** | -4.8739*** |
| lnlab | -1.1988 | -1.0661 | -6.2025*** | -2.6471* |

Note: all variables are in the natural log

*level of significance at 10% **level of significance at 5% ***level significance at 1%

The results for the unit root test are reported in table 4. All that data are transformed into the natural log form. To determine the order of integration of the variables, the ADF (augmented Dickey-Fuller) test complemented with the PP (Philips-Perron) test in which the null hypothesis is $H_O = \beta = 0$ (i.e$\beta$ has a unit root) and the alternative hypothesis is $H_1: \beta < 0$ are implemented. The result for both the level and differenced variables presented in table 6.

The stationarity tests were performed first in levels and then in first difference to establish the presence of unit roots and the order of integration in all the variables. The results of the ADF and PP stationarity tests for each variable show that both tests fail to reject the presence of unit root for real gdpc, trade openness, labour force and gross fixed capital formation data series in level, indicating that these variables are non-stationary at levels. The first difference results show that these variables are stationary at 1% and 10% significance level (integrated of order one 1(1)) respectively. However, the composite index recorded presence of stationarity at first level 1(0) at 1% level significant (ADF) and (PP) respectively. The different order of integration of the variables makes ARDL the preferred approach to this empirical study.

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**Results of Cointegration Test**

**Table 7: ARDL bounds cointegration test**

| Function | | F-statistic | Result |
|---|---|---|---|
| Frgdpc(rgdpc/Fdindex,Open,Lab,Gfcf | | 3.1624* | Cointegration |
| Critical Value Bounds | 1% | 5% | 10% |
| I0 Bound | 3.29 | 2.56 | 2.2 |
| I1 Bound | 4.37 | 3.49 | 3.09 |

Notes: Source of Asymptotic critical value bounds: Pesaran and Shin (1999)

Restricted intercept and no trend

*level of significance at 10%

The result of the cointegration test, based on the ARDL bound testing approach, is presented in Table 7. Cointegration is tested on model using real gdpc as the dependant variable. The results show that the F-statistic is higher than the upper bound critical value from at the 10% level significance using restricted intercept and no trend in specification for the model. This indeed implies that all the trade liberalization, selected independent variable and real gdpc are bound by a long run relationship in Nigeria which means that the variables included in the model shared long-run relationships among themselves. However, these results are consistent with the finding of Hye (2012).

**Long-Run Elasticities**

Table 8: Long run coefficients

| Explanatory Variables | lnrgdpc ARDL(1,1,2,0,0) |
|---|---|
| C | 21.4829 (0.2994) |
| lnFDindex | 0.3021 (0.9292) |
| lnOpen | -0.1910(-1.7166)* |
| lnLab | -2.6439(-0.1465) |
| lnGfcf | 0.3466 (1.0281) |

Note: t-statistics

*level of significance

Table 8 presents the long run coefficients estimated using ARDL approach. The results of the model lnrgdpc shows that the coefficient of trade openness a statistically significant negative effect on real per capita income (rgdpc) in the long-run with

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coefficient of -0.1910 at 10% level of significance. With a coefficient of -0.1910, a 1% decrease in trade openness with cause the rgdpc to decrease by about 0.191% in the long run vice versa. This do follow the finding and conclusions made by Musleh-ud Din, Ejaz Ghani, and Omer Siddique (2003) Gould and Ruffin (1995) that there is evidence positive long-run equilibrium relationship between openness and economic. A good number of studies have found negative relationship between trade openness and economic growth. (See Feenstra (1996), Grossman and Helpman (1991) and Srinivasan (2001), Rodrik (2001. Hye (2012). Our finding is nott in line with the result of Hoque and Yusop (2010) examined the impact of trade liberalisation on the aggregate import in Bangladesh, using the ARDL Bounds Test approach and suggest that trade liberalisation do have insignificantly effect in the long run. The coefficient of lnFDindex and gfcf have statistically insignificant relationship with rgdpc at 10% level of significant. Overall, the results of the model depict the dominant negative role of trade liberalization in the economic growth of Nigeria over the period of study.

**Short Run Adjustment and Impact**

**Table 9:** ECM representation of the ARDL model

Model selected on Akaike infor criteria (AIC)

| Explanatory Variables | Δlnrgdpc ARDL(1,1,2,0,0) |
|---|---|
| ecm(-1) | -0.1367(-4.4671)*** |
| ΔlnFDindex | -0.0598(-1.2860) |
| ΔlnOpen | 0.1010(2.8416)*** |
| ΔlnLab | -0.03177(-0.0068) |
| ΔlnGfcf | 0.0498(1.1501) |
| R-squared | 0.9645 |
| Adj R-squared | 0.9522 |
| D-W statistic | 2.0112 |
| SCX(2) | 3.8576[0.1453] |
| HetX(1) | 4.8714[0.7712] |
| REMSEY RESET | 0.2428[0.8104] |

Note ***indicates significance level at 1%

Table 9 presents the error correction estimation for the ARDL model. The coefficient of the ECM variable is found to be negative and statistically significant at 1% level confirming the existence of long run relationship among variables. The coefficient of ECM for the cointegrating equation with Δlnrgdpc as the dependant variable shows a low speed adjustment back to equilibrium position, with about 13.67% of disequilibrium in the previous year returning to the long run equilibrium in the current year.

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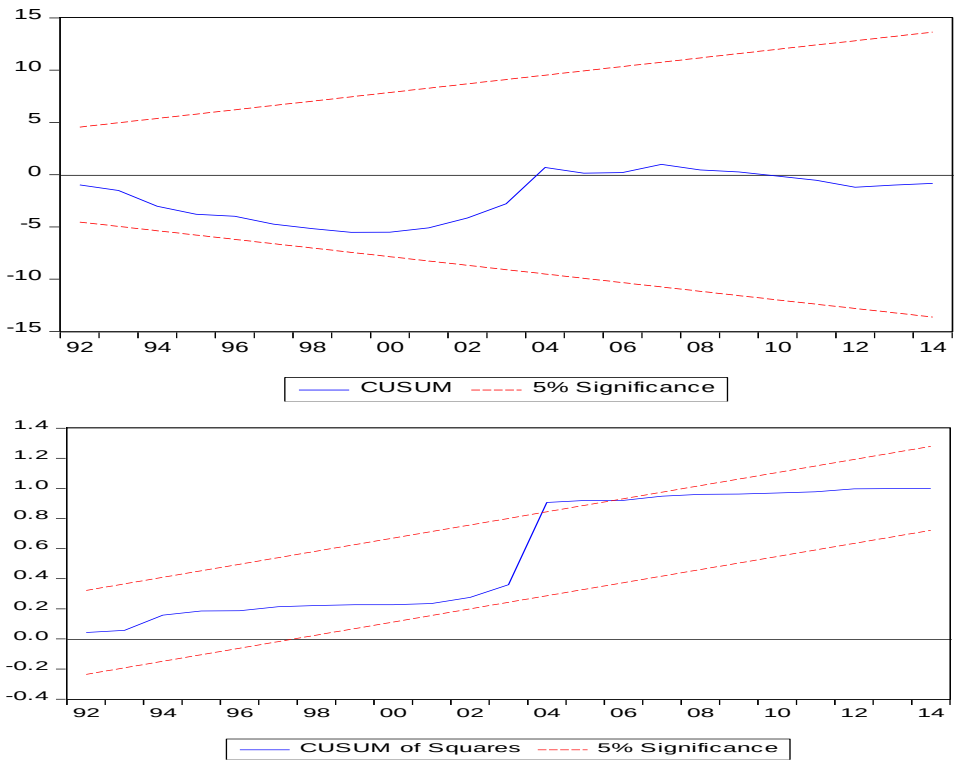
The short run coefficient suggest that trade openness has positive significant impact on the real GDP per capital income at 1% level in the short run. (See Ben-David & Loewy, 1998; Edwards, 1993; Harrison, 1996; Keller, 2002; among others). Surprisingly, financial development index and labour is negative and insignificant at 10% level. Gross fixed capital formation is positive and statistically insignificant in the model.

**Diagnostic and Stability Tests**

From the diagnostic test result (see figure 9), there is no evidence of serial correlation, heteroscedasticity and the model is well specified in the ARDL models. The stability of the long-run coefficient is tested by the short-run dynamics. Once the ECM model given in table 9 has been estimated, the cumulative sum of recursive residuals (CUSUM) and the CUSUM of square (CUSUMSQ) tests are applied to assess parameter stability (Pesaran and Pesaran, 1997). Figures 2 plot the results for CUSUM and CUSUMSQ tests. The results indicate the absence of any instability of the coefficients because the plot of the CUSUM and CUSUMSQ statistic fall inside the critical bands of the 5% confidence interval of parameter stability.

Figure 2 plot of CUSUM and CUSMQ for the coefficient stability of ECM model Δlnrgdpc

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## Summary and Conclusion

This study examined the impact of trade liberalization in Nigeria as a developing economy from 1981 to 2014. It employed the Autoregressive Distributed Lag (ARDL) bound test approach. The long run impact of trade liberalization on the growth of the Nigeria economy using read GDP as the dependant variable is found to be negatively significant. The short run impact of trade liberalization on economic growth is found to positive and significant. In total, the long and short run impact of trade liberalization to economic growth suggest that the Nigeria economy is yet to harness the benefits of international trade. With the introduction of other variables in the likes of financial development, labour force and gross capital formation none played a significant impact on economic growth in the Nigeria. Again, this is an indication that Nigeria has a lot to do in the exploit and harness of its potential.

The findings of this study offer some important policy implications. Trade liberalization could be another avenue for economic diversification through foreign direct investment and by so doing there will be improved in gross capital formation and indeed economic growth. Furthermore, unfavourable trade policy could distort outputs in the local industries, particularly in agriculture to collapse, and export diversification to retrench. Dependence on a single export commodity makes the economy vulnerable to international demand tremors. Nigeria should give export diversification and the development of essential industries a more serious consideration. The policy implication of our results is that Nigeria needs to intensify and stable trade and investment reforms to promote sustainable long run economic growth. As an open economy, there should be need to complement reforms in trade and investment sectors with reforms in education sector. Investing in more and better-distributed education in the labour force helps create conditions that are conducive to higher productivity and sustainable growth. Nigeria also needs to create diversified, dynamic and competitive sectors capable of absorbing the more educated labour force to translate human capital to higher economic growth.

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