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Is Nigerian Growth Trade-Led?

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ABSTRACT

Purpose

Nigeria is currently in recession, a situation described as induced by decreases in oil output and export, caused by the bombings of oil pipelines in its Niger Delta region, and the unanticipated decline in its value of exports and currency, resulting from the decline in oil prices. With the export value decline, somersaulting to growth, could it then be that Nigerian economic growth is trade constrained? How important is export to growth?. This study investigates these, its invention balances in its methodology

Design/methodology/approach:

To achieve the above, this paper employs the Autoregressive Distributed Lag Model (ARDL) and the Thirlwall's Law of balance of payment led growth, using a combination of annual (1981 – 2016) and quarterly (2000Q1 – 2016Q4) data to ensure robustness. This combination not only allows for comparison but also ensures the reflection of the current government's trade decisions and trade activities; these are missing in other studies.

Findings:

Using the Wald F-Statistic, Economic growth is found to be equal to export growth rate divided by income elasticity of import, the estimated income elasticity of import which is greater than 100% or elastic reflects over dependence on import both in the short and long run, implying that Nigeria imports more than it earns. Exchange rate and terms of trade are insignificant especially in the long run. The study calls for monitoring of import contents; the government needs to enforce its recent directives to stop importation of some products that are already being produced within with higher quality and adequate export promotion strategies should be formulated and enforced.

Research limitations/implications:

The data span is restricted by data availability, the study could as well confirm its results with monthly data for robustness and better confidence, but most of the variables are reported annually and quarterly only.

Originality/value:

Many studies have confirmed the importance of export to Nigerian economic growth; none known to this study has combined both quarterly and annual data and covered recent data as this. This study will help policy makers in their focus when trying to deal with negative economic adjustments.

Keywords:

Export, Economic Growth, ARDL, Thirlwall's Law, Nigeria

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1. Introduction

The orthodox economic theory is premised on a supply-driven economic system and a self-equilibrating balance of payment as accentuated by Say's Law, where growth is ascertained by factor inputs and technical advancement (see, Braudel, 1979). The inefficiency of

this was later realized from the lessons taught by the great economic slump. John Maynard Keynes was able to tell us that the capitalist economy, where everything depends on market forces and whose basis is supply oriented, is inherently unstable, and there is the need to focus on aggregate demand (see Keynes, 1936; Thirlwall, 1979; McCombe and Thirlwall, 2004; and Aricioglu, *et*

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al., 2013). In an open economy, the aggregate demand is more important; what if against Say's Law, what is produced is not demanded, would it not be better to allow demand to create its own supply? According to Thirlwall (1979), the growth of an economy may be constrained by its aggregate demand long before the optimum supply is attained. If therefore, aggregate demand or economic output is constrained by the balance of payment equilibrium, it is impossible to understand the differences in the long run economic growth among countries without reference to the balance of payment (McCombie and Thirlwall, 2004).

Prior to the 1970's oil discovery in Nigeria, investment projects were executed with domestic savings, the big earnings from agricultural product exports, foreign aids and the advantageous increasing industrialization in the developed countries, which created a prosperous market for the Nigerian primary products (Okezie, 2011). However, after the discovery of oil and its massive and increasing exportation since the 1970s, one would expect that more foreign exchange earnings would accrue to the economy and the economy would be able to undertake viable investment projects that continue to lay a basis for sustainable growth and development, but the drastic divergence from agriculture and high dependence on oil that stands to compete with international technological development has finally paid off negatively on the economy. The large competition experienced in the international oil market, has deteriorated the price of oil and the total export value by Nigeria, and the continuous unrest in the Niger Delta region of the country resulting in bombings of oil pipelines, thereby decreasing oil production capacity and export, and causing a reduction in economic growth. These has paralysed the Nigerian currency and real economic growth up until the first quarter of 2017 when the end of tunnel seems to bear some light; the country has been in recession (see, Okonkwo, 1989; Awokuse 2008; Njoku and Olajide, 2016; IMF, 2017, and Ismail & Adenekan, 2017).

With these turbulent, somersaulting from export decline in growth, could it be that Nigerian long run aggregate demand is constrained by the balance of payment current account equilibrium? If true, would Nigeria not need to focus on its export sector to promote growth and escape depression? This study investigates this. The study differs in its approach, a combination of quarterly and annual data is employed to emphasize the robustness of the results and a longer data span that covers recent economic activities is used. No study known to the authors has conducted the same research via the same methodology in terms of data span and data combination.

2. Theoretical and Empirical Literature

No country can grow beyond the growth coherent with equilibrium in the balance of payment on current account unless it is prepared to infinitely finance growing deficit, which surely it cannot (Thirlwall, 2011). In his pioneering study, the growth experiences of major advanced countries were analyzed by Thirlwall, where he demonstrated that the growth in these countries approximates to the growth rate of export, divided by the income elasticity of import.

According to Thirlwall "It is demand that 'drives' the economic system to which supply, within limits, adapts. Taking this approach, growth rates differ because the growth of demand differs between countries". This proposition has resisted several heterodox criticisms over time with some modifications introduced in the case of developing and underdeveloped economies (see, Razmi 2011;2016; Ros 2013; Clavijo and Ros 2015; and Ibarra and Blecker 2016).

The validity of Thirlwall's law is well proclaimed; such studies that emphasized Thirlwall's law include Lima and Carvalho (2008) in which they explained that in the long run aggregate demand plays an important role in determining economic growth. If a country's growth rate results in the import growth rate raising above growth of exports, the resulting deterioration in the balance of payments disturbs the system of economic growth and hence reduces economic growth (Acaravci and Ozturk, 2010). Kilavuz and Topcu, (2012) also explain that when the supply elasticity of demand and the demand elasticity of demand for a country's commodity rise; this stimulates the export-led growth of the economy pioneered by its industrialization, this is why they reasoned that Kaldor (1968) referred to industry as the "engine of growth". To Kaldor, growth in industrial manufacturing sector is made possible by growth in external demand; that is, through export growth. The higher the manufacturing industry growth rate that export determines, the faster the transfer of labour from sectors in which economic productivity is low to the industrial sector, which leads to a faster productivity increase and results in macroeconomic growth.

Yongbok (2006) empirically tested the validity of Thirlwall's law in the case of China during the reforms period of 1979 to 2002; the study estimated the income elasticity of imports using the ARDL-VEC model and the bounds test. The results revealed that the Chinese economy has grown in accordance with the predictions of Thirlwall's law and that the growth of GDP and exports are co integrated over the sample period. Hansen and Virmantas (2004), in examining the balance of payments constrained growth model in three Baltic countries, found that based on their estimation of income elasticity of imports and assumptions about export growth, GDP growth rates are consistent with the balance of payment equilibrium. Complementing these results, Alvarez *et al.* (2008) concluded that the balance of payment is an important determinant of the Cuban long run economic growth over the periods of 1960 to 2004, after employing the Johansen co-integration technique, the result revealed that economic growth, exports of goods and services, and terms of trade, are driven by a common stochastic trend. The study then drew conclusions that economic growth is constrained by the country's external demand position.

Several authors have tested the validity of Thirlwall's proposition in Nigeria, this study however is inventive in nature for using both quarterly and annual data to examine if the results differ, and also extends the data span to accommodate recent economic activities in Nigeria.

3. Theoretical Framework and Methodology

3.1 The Framework

The picture displayed in the Balance of Payment Constrained Growth (BPCG) theory explains trade – growth interactions, especially the proposition that growth of an economy is demand-led and that demand is trade-led, this is coherent with perpetual external trade balance where exports value equals imports value as in equation (1),

$$P_h X = P_f M E \tag{1}$$

$$X = c \left(\frac{P_h}{P_f E} \right)^\infty Z^\pi$$

Where $c, \pi > 0 \quad \infty < 0$ (2)

$$M = k \left(\frac{P_f E}{P_h} \right)^\omega Y^\psi$$

Where $g, \psi > 0 \quad \omega < 0$ (3),

where P_h is export price (domestic currency), the price of import is P_f (in foreign currency), X is export, M is import and E refers to nominal exchange rate (domestic price of foreign currency). Z represents world income, Y is domestic income, and ∞, π, ω and ψ are price elasticity of export, income elasticity of export, price elasticity of import and income elasticity of import respectively.

$$p_h + x = p_f + m + e \tag{4}$$

$$x = \infty(p_h - p_f - e) + \pi z \tag{5}$$

$$m = \omega(p_f + e - p_h) + \psi y \tag{6}$$

The proportional rates of growth of equation (1), (2) and (3) are given by equations (4), (5) and (6) Substituting equations (5) and (6) into (4), equation (7) results in;

$$y = \frac{(1 + \infty + \omega)(p_h - p_f - e) + \pi z}{\psi} \tag{7}$$

$$y = \frac{(1 + \omega)(p_h - p_f - e) + x + \pi z}{\psi} \tag{8}$$

Given that the rate of growth of the world income is exogenous, that is $z = \bar{z}$ and that the relative prices and exchange rates in the international market are relatively constant in the long run, then equation (8) will reduce to (9). Equation (9) is the canonical equation for the long run equilibrium rate of economic growth in the Balance of Payment Constrained Growth (BPCG) model (see, Setterfield, 2011).

$$y^{**} = \frac{x}{\psi} \tag{9}$$

The income elasticity of import (ψ) can be derived from the long run estimation of equation (3) as stated in equation (10).

From equation 3, taking the natural logarithm

$$\ln M_t = \ln k + \omega \ln P_t + \omega \ln E_t + \psi \ln Y_t$$

$$k \text{ is constant and } P_t = \frac{P_f}{P_h} \tag{10}$$

Also, the growth rate of export (x) is derived using $x_t = \ln X_t - \ln X_{t-1}$.

3.2 Methodology

Based on the ongoing, this study employs the Autoregressive Distributed Lag Model (ARDL) of Pesaran and Shin (1999) and Pesaran *et. al.*, (2001) in estimating equation (10), this method is also popularly referred to as the Unrestricted Error Correction Model (UECM) or Bound Test. The procedure can be used efficiently for small sample data. The procedure allows the combination of a series of different orders of integration, $I(0)$ or $I(1)$. However, unlike the notion in some studies, there is still the need to carry out the traditional unit root tests, to ensure that none of the series is $I(2)$ and to difference such if it occurs. (See, Tang, 2003; Pesaran and Tosetti, 2011; and Tursoy, 2016).

From equation (10), the ARDL specification is given in equation (11);

$$\begin{aligned} \Delta \ln M_t = & \gamma + \sum_{i=1}^p \delta_i \Delta \ln M_{t-i} + \\ & + \sum_{i=0}^p \omega_i \Delta \ln P_{t-i} + \sum_{i=0}^q \phi_i \Delta \ln E_{t-i} + \\ & + \sum_{i=0}^r \psi_i \Delta \ln Y_{t-i} + \delta_1 \ln M_{t-1} + \delta_2 \ln P_{t-1} + \\ & + \delta_3 \ln E_{t-1} + \delta_4 \ln Y_{t-1} + \varepsilon_t \end{aligned} \tag{11}$$

The last part of equation (11) without operators represent the long run parameters, the Wald F-statistic is used to test for co-integration, by testing the null hypothesis of $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$, that is, no co-integration or no long run equilibrium. A rejection of this suggests long run relationship. After the co-integration test, the long run and short run import equation relationships are estimated and from this, the income elasticity of import (the coefficient of $\ln Y_t$ (ψ) as in equations (9) and (10)) is obtained, “predicted growth rate” (y_t) will then be calculated by the ratio of export growth rate and income elasticity of import (as in equation (9)), after which this predicted growth rate will

be regressed on the actual growth rate (\dot{Y}_t) represented by GDP growth rate. The Wald F statistic is used again to test for the Thirlwall’s law, in equation (12) that is

$$\begin{aligned} a = 0 \quad \text{and} \quad b = 1 \\ y_t = a + b \dot{Y}_t \end{aligned} \tag{12}$$

3.3 Data Description

Distinct from the past studies conducted on Nigeria for the test of Thirlwall’s law, this study employs both

quarterly and annual data to ensure result robustness, higher frequency data may produce results that differ, a data span covering activities of the new government and capturing recent economic affairs is also used. The data used are sourced from the Central Bank of Nigeria Statistical Bulletins for 2015 and 2016. The annual data spans from 1981 to 2016 (36 observations), while the quarterly data spans from 2000Q1 to 2016Q4 (68 observations). The choice of data span is dictated by data availability from the same source and that the quarterly data for most of the series are available only from the year 2000Q1.

4. Empirical Results

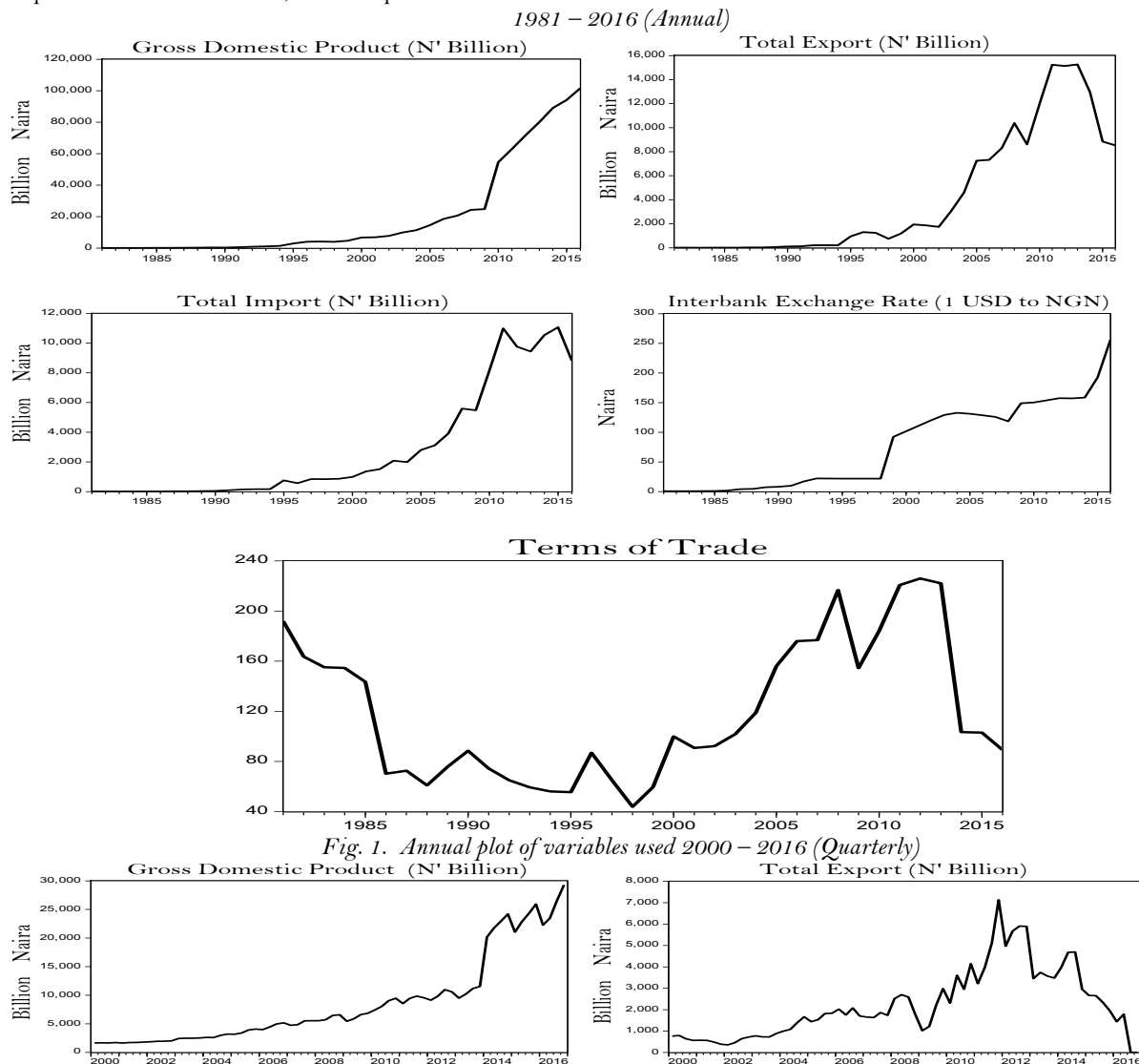
4.1 Graphical Presentation and Descriptive Statistics

Figure 1 and Figure 2 present the time series plot of annual and quarterly Gross Domestic Product (GDP), Export (EXP), Import (IMP), Exchange rate (EXR) and Terms of Trade (TOT). Both annual and quarterly data are plotted to clearly reflect movements in the series over years, apart from terms of trade that is S-like, other series tend upward, which simply suggests positive correlations, the quarterly data however suggests otherwise as the fluctuations become more obvious.

The quarterly plot reveals increasing but fluctuating imports since around 2012, while exports have been on a

fluctuating fall from early 2012 to 2016, the fall is more aggressive immediately after 2014 until the end of 2016, a suggestion that reveals the net consuming nature of the Nigerian economy. Exchange rate from the annual and quarterly plot is on the increase, Nigerian currency loses its value with fluctuations in the US dollar. The decline in the rate of growth is more obvious on the quarterly data plot.

Table 1 presents the descriptive statistics of the series, using the method proposed by Jarque and Bera (1987), the Jarque Bera probabilities (JB) suggest an acceptance of the null hypothesis of normal distribution. Under the assumptions of normal distribution, it is assumed that skewness and kurtosis have asymptotic distributions of $N(0)$ and $N(3)$ respectively (Gujarati, 2003). The table shows that almost all variables have negative skewness, which means that decreases occur more often than increases, although, the kurtosis values for the series are all below the threshold of 3, the use of kurtosis and skewness is not enough to justify the normal distribution of a series since the thresholds are not realistically obtainable, a compensating statistic is the Jarque Bera statistic, which suggests that all variables are normally distributed as shown on table 1.



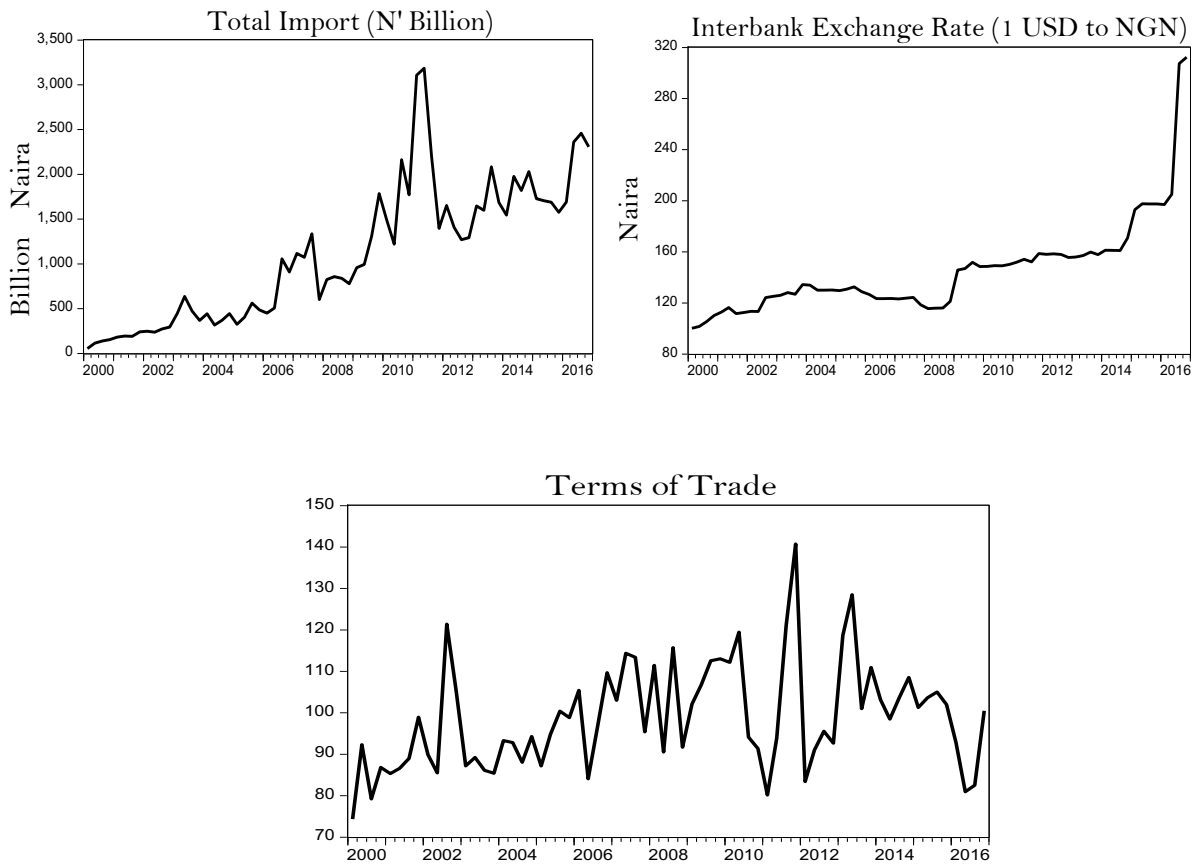


Figure. 2. Quarterly plot of variables used

Table 1. Descriptive Statistics

| | <i>Annual</i> | | | | |
|--------------|------------------|------------------|-----------------|-----------------|----------------|
| | <i>Mean</i> | <i>Std. Dev.</i> | <i>Skewness</i> | <i>Kurtosis</i> | <i>JB. Pr.</i> |
| <i>lnGDP</i> | 8.1447 | 2.3349 | -0.1529 | 1.7127 | 0.2690 |
| <i>lnEXP</i> | 6.5206 | 2.6558 | -0.4646 | 1.7887 | 0.1741 |
| <i>lnIMP</i> | 6.1488 | 2.5804 | -0.3997 | 1.7369 | 0.1871 |
| <i>lnEXR</i> | 3.2896 | 1.9519 | -0.7338 | 2.1915 | 0.1217 |
| <i>lnTOT</i> | -4.6677 | -0.4711 | -0.6290 | 1.7620 | 0.3131 |
| | <i>Quarterly</i> | | | | |
| | <i>Mean</i> | <i>Std. Dev.</i> | <i>Skewness</i> | <i>Kurtosis</i> | <i>JB. Pr.</i> |
| <i>lnGDP</i> | 8.6892 | 0.8732 | 0.1779 | 1.9772 | 0.1899 |
| <i>lnEXP</i> | 7.4931 | 0.7517 | -0.3143 | 2.2349 | 0.2493 |
| <i>lnIMP</i> | 6.6761 | 0.9199 | -0.6778 | 2.6612 | 0.0629 |
| <i>lnEXR</i> | 4.9538 | 0.2196 | 1.3613 | 5.8158 | 0.0000 |
| <i>lnTOT</i> | -4.5845 | -0.1272 | -0.3615 | 2.8318 | 0.4580 |

Note: Std. dev means standard deviation and JB pr. is Jarque Bera Probability

4.2 Stationarity Test

The results of the unit root tests performed on the natural logs of the series are presented in table 2, using the Augmented Dickey – Fuller (ADF) and Phillips-Perron unit root tests (see, Fuller, 1976; Dickey and Fuller, 1979; and Phillips and Perron, 1988), the result shows that apart from the quarterly terms of trade which is $I(0)$, other series are $I(1)$, this means that all the series are stationary only after first difference except quarterly terms of trade which is stationary at level. The result

suggests that the series be differenced to ensure constancy in their means, a non-stationary series may render estimates spurious. Meanwhile, differencing a variable removes its long run properties; this is a trade-off, however reasonable estimation technique to bypass this problem is the Autoregressive Distributed Lag model (ARDL) that permits the combination of $I(0)$ and $I(1)$ series and estimates both short-run and long run relationships simultaneously.

Table 2. Stationarity Test Results

| Var. | Level Series | | | | First Difference | | | |
|-------|--------------|-----------|----------|-----------|------------------|-----------|---------|-----------|
| | ADF | | PP | | ADF | | PP | |
| | Annual | Quarterly | Annual | Quarterly | Annual | Quarterly | Annual | Quarterly |
| lnGDP | 0.8722 | 0.9728 | 0.8715 | 0.9817 | 0.0000* | 0.0000* | 0.0000* | 0.0000* |
| lnEXP | 0.6117 | 0.5695 | 0.5915 | 0.6074 | 0.0000* | 0.0000* | 0.0000* | 0.0000* |
| lnIMP | 0.7241 | 0.0557 | 0.8014 | 0.0425 | 0.0000* | 0.0000* | 0.0000* | 0.0000* |
| lnEXR | 0.3290 | 0.9991 | 0.27470. | 0.9993 | 0.0002* | 0.0000* | 0.0002* | 0.0000* |
| lnTOT | 0.3268 | 0.0000* | 3069 | 0.0000* | 0.0000* | 0.0000* | 0.0000* | 0.0001* |

Note: all figures are probability values and * denotes 1% significance, the variables are all in natural logarithm forms and Var. means Variables.

4.3 Lag Selection

Table 3 presents the result of the optimum lag selection, all criteria suggest lag one for both the annual and

quarterly data. Although, the ARDL automatically selects the optimum lag structure during estimation, it has become traditional to check optimum lags before estimation

Table 3. Lag Selection

| Lags | LogL | LR | FPE | AIC | SC | HQ |
|------------------|-----------|-----------|-----------|------------|----------|----------|
| <i>Annual</i> | | | | | | |
| 0 | -120.2921 | NA | 0.021959 | 7.532855 | 7.7142 | 7.5938 |
| 1 | 9.486745 | 220.2308* | 2.24e-05* | 0.637167* | 1.5441* | 0.9423* |
| 2 | 19.88013 | 15.11766 | 3.30e-05 | 0.976962 | 2.6095 | 1.5262 |
| 3 | 29.91771 | 12.16676 | 5.36e-05 | 1.338320 | 3.6964 | 2.1317 |
| <i>Quarterly</i> | | | | | | |
| 0 | -8.017141 | NA | 1.70e-05 | 0.369758 | 0.5035 | 0.4225 |
| 1 | 213.1392 | 408.2886* | 3.09e-08* | -5.942744* | -5.2737* | -5.6787* |
| 2 | 218.1161 | 8.575597 | 4.36e-08 | -5.603572 | -4.3992 | -5.1284 |
| 3 | 229.6907 | 18.51939 | 5.07e-08 | -5.467406 | -3.7278 | -4.7810 |

Note: * denotes optimum lag selected

4.4 ARDL Model Result for Equation (11)

As stated in equation 11, the autoregressive distributed lag model is estimated to carry out the Bound test and estimate long run and short run relationships. In table 4, the selected autoregressive model for the two data frequencies differ, for the annual data, after estimating about 500 equations, the best equation using the Akaike Information criterion (AIC) is selected to be ARDL (1, 4, 0, 1), while ARDL (1, 0, 0, 0) is selected for the quarterly data, after estimating 500 models. The coefficients of

determination for the two (2) equations are very high and their closeness to their respective adjusted R² suggests non-inclusion of irrelevant variables, the Durbin Watsons are also close to the threshold of 2 a suggestion of no autocorrelation. The output of the ARDL model may need to be decomposed if co-integration is discovered, so that the short run relationships can be explained separately from the long run relationships.

Table 4. ARDL Model Result

Dependent Variable: lnIMP

| Annual | | | | Quarterly | | | |
|---|--------------|---------|----------|---|--------------|---------|---------|
| Variables | Coefficients | t-stat | Prob. | Variables | Coefficients | t-stat | Prob. |
| lnIMP(-1) | 0.0809 | 0.4121 | 0.6842 | lnIMP(-1) | 0.7268 | 9.8375 | 0.000* |
| lnTOT | -0.0177 | -0.0935 | 0.9263 | lnTOT | 0.1181 | 0.4372 | 0.6634 |
| lnTOT(-1) | -0.1487 | -0.6070 | 0.5500 | lnEXR | -0.1451 | -0.5394 | 0.5915 |
| lnTOT(-2) | -0.0079 | -0.0349 | 0.9724 | lnGDP | 0.2481 | 2.5457 | 0.013** |
| lnTOT(-3) | -0.0073 | -0.0298 | 0.9765 | Constant | 0.9760 | 0.6032 | 0.5486 |
| lnTOT(-4) | -0.6069 | -2.6366 | 0.0151** | | | | |
| lnEXR | 0.0786 | 0.6966 | 0.4933 | | | | |
| lnGDP | 1.3747 | 5.3020 | 0.0000* | | | | |
| lnGDP(-1) | -0.4105 | -1.5295 | 0.1404 | | | | |
| Constant | -0.4164 | -0.7562 | 0.4575 | | | | |
| R ² = 0.99, Adj. R ² = 0.98, DW = 2.16 ARDL (1, 4, 0, 1) | | | | R ² = 0.93, Adj. R ² = 0.92, DW = 2.15 ARDL (1, 0, 0, 0) | | | |

Note: *, **, *** denotes 1%, 5% and 10% significance respectively, the variables are all in natural logarithm forms.

4.5 Result of the Bound Test (Co-integration Test)

The result of the co-integration test is presented on table 5, using the Bound Test technique to test the null hypothesis of no co-integration, the Wald F – Statistic is compared with the critical values of the lower and upper bounds. A statistic above the upper bound suggests presence of co-integration, while below the lower bound means no co-integration and a statistic between the two (2) boundaries reveals inconclusiveness, (see, Pesaran *et al.*, 2001). In table 5, the annual data series estimates co-integrate even at 1% (6.79 > 5.61), but the quarterly data series are only co-integrated at 10% (4.22 > 3.77). The study therefore proceeds to derive the long and short run estimates of the ARDL model having rejected the null hypothesis of no co-integration. The long and short run estimates are presented in table 6.

Table 5. Bound Test Result

| Test Statistic | Annual | | Quarterly | | |
|-----------------------|-------------|-------------|----------------|-------------|-------------|
| | Value | k | Test Statistic | Value | k |
| F-statistic | 6.798780* | 3 | F-statistic | 4.220936 | 3 |
| Critical Value Bounds | | | | | |
| | <i>I(0)</i> | <i>I(1)</i> | | <i>I(0)</i> | <i>I(1)</i> |
| Significance | Bound | Bound | Significance | Bound | Bound |
| 10% | 2.72 | 3.77 | 10% | 2.72 | 3.77 |
| 5% | 3.23 | 4.35 | 5% | 3.23 | 4.35 |
| 2.5% | 3.69 | 4.89 | 2.5% | 3.69 | 4.89 |
| 1% | 4.29 | 5.61 | 1% | 4.29 | 5.61 |

Note: *, **, *** denotes 1%, 5% and 10% significance respectively.

4.6 Short run and long run Contemporaneous Estimation of the Import Function

In table 6, the growth rate of income in Nigeria represented by the growth rate of Gross Domestic Product (GDP) continues to be a significant determinant of import growth, both in the short and long run. The general significance of terms of trade is however in doubt, as only terms of trade growth in the past three years influence export growth significantly in the short run using the annual series, meanwhile the quarterly data pronounces it as insignificant in the short run.

The same also holds for terms of trade in the long run; the annual data shows that it is significant in determining growth of import, but the higher frequency data pronounced it otherwise. Since the quarterly data is expected to expose more properties of a series, this result may suggest a validation of Thirlwall’s law’s non-significance of terms of trade in the long run; this validation obviously is then better obtained with a long span of data. The exchange rate however remains insignificant throughout.

Note that the coefficient of income growth rate (lnGDP) in the long run, which is Thirlwall’s income elasticity of import ψ , as in equation 9, is obtainable in table 6 as 1.0490 for the annual data and 0.9085 for the quarterly data. Annual and quarterly data on export growth rate are divided by these coefficients respectively to obtain Thirlwall’s predicted growth rate. These predicted growth rates are then regressed on actual growth rate and the equality is tested using the Wald F-Statistic.

Table 6. Co-integrating Form of the ARDL

| Short run Annual | | | | Short run Quarterly | | | |
|------------------|-------------|---------|---------|---------------------|-------------|---------|----------|
| Variable | Coefficient | t-Stat | Prob. | Variable | Coefficient | t-stat | Prob. |
| D(lnTOT) | -0.0177 | -0.0935 | 0.9263 | D(lnTOT) | 0.1181 | | 0.6634 |
| D(lnTOT(-1)) | -0.0079 | -0.0349 | 0.9724 | D(lnEXR) | -0.1451 | 0.4372 | 0.5915 |
| D(lnTOT(-2)) | -0.0073 | -0.0298 | 0.9765 | D(lnGDP) | 0.2481 | -0.5394 | 0.0134** |
| | | | | D(ointEq(-1)) | -0.2731 | | 0.0005* |
| | | | | | | 2.5457 | |
| D(lnTOT(-3)) | -0.6069 | -2.6366 | 0.0151 | | | -3.6961 | |
| D(lnEXR) | 0.0786 | 0.6966 | 0.4933 | | | | |
| D(lnGDP) | 1.3747 | 5.3020 | 0.0000* | | | | |
| CointEq(-1) | -0.9190 | -4.6802 | 0.0001* | | | | |
| Long run Annual | | | | Long run Quarterly | | | |
| Variable | Coefficient | t-Stat | Prob. | Variable | Coefficient | t-Stat | Prob. |
| lnTOT | 0.4959 | 3.0986 | 0.0052* | lnTOT | 0.4326 | 0.4197 | 0.6761 |
| lnEXR | 0.0855 | 0.6956 | 0.4939 | lnEXR | -0.5315 | - | 0.5938 |
| lnGDP | 1.0490 | 11.0633 | 0.0000* | lnGDP | 0.9085 | 3.5561 | 0.0007* |
| | | | 0.4330 | | 3.7537 | | 0.5697 |
| Constant | -0.4530 | -0.7986 | | Constant | | 0.5715 | |

Note: *, **, *** denotes 1%, 5% and 10% significance respectively, the variables are all in natural logarithm forms.

Table 7 presents the diagnostic tests on the stochastic term of the ARDL regression based on the assumptions of the error term in the Ordinary Least Square Regression. The result shows an acceptance of all null

hypotheses, that is, the error term is normally distributed (Jarque Bera), no serial correlation (Breusch-Godfrey) and there is homoscedasticity (ARCH).

Table 7. Diagnostic Test of the ARDL Regression Result

| Tests | Probability Values | |
|--|--------------------|-----------|
| | Annual | Quarterly |
| Breusch-Godfrey Serial Correlation LM Test | 0.6911*** | 0.8453*** |
| ARCH: Heteroscedasticity Test | 0.7345*** | 0.9028*** |
| Normality Test | 0.6398*** | 0.1483*** |

*** denotes acceptance of null hypothesis at 1%, 5%, and 10% significance level.

4.7 Test of Thirlwall’s Law

Since the long run income elasticity of import is now obtainable from table 6, and export growth rate can be calculated, then the annual and quarterly predicted

growth rate can be derived using equation (9). Table 8 presents the annual and quarterly income elasticity of import extracted from table 6.

Table 8. Income Elasticity of Import

| From equation 9 and table 6, | Annual | Quarterly |
|---|---------|-----------|
| ψ , | | |
| Income Elasticity of import or the coefficient of lnGDP in the long run | 1.0490* | 0.9085* |

Note: * denotes 1% significance level

Recall that,

$$y^{**} = \frac{x}{\psi}, \quad \text{that is } GDP \text{ growth} = \frac{\text{export growth rate}}{\text{income elasticity of import}}$$

From equation 12

$$y_t = a + b\dot{Y}_t \quad \text{where } y_t \text{ is the predicted growth rate and } \dot{Y}_t \text{ is the actual GDP growth rate}$$

Table 9. Test of Equation 12 (Regression Result)

| Variable | Annual | | | Quarterly | | | |
|-------------|-------------|---------|---------|-------------|-------------|-----------|---------|
| | Coefficient | t-Stat | Prob. | Variable | Coefficient | t-stat | Prob |
| a | -0.0206 | -0.6571 | 0.5134 | a | -0.0514 | -0.658513 | 0.5148 |
| \dot{Y}_t | 1.0032 | 3.3355 | 0.0014* | \dot{Y}_t | 1.1663 | 4.191640 | 0.0002* |

Note: *, denotes 1% significance level

Table 9 presents the OLS regression result of equation 12, the Wald F-statistic of coefficient restriction test is then used to test the assumption that $a=0, b=1$, the result of which is presented in table 10. The probability values for both annual and monthly data shows an acceptance of the null hypothesis. The study then

concludes that Nigerian economic growth rate is a balance of payment constrained. Whether quarterly or annual data is employed, the result remains the same, even though the magnitude of influence may differ with different data properties. Thirlwall’s law continues to be remarkable and durable in Nigeria.

Table 10. Wald Test of Thirlwall’s Law $H_0: a=0, b=1$

| Test Statistic | Annual | | | Quarterly | | |
|----------------|----------|---------|--------|-----------|--------|--------|
| | Value | df | Prob. | Value | df | Prob. |
| F-statistic | 0.233850 | (2, 33) | 0.7928 | 0.256034 | (2,65) | 0.7749 |
| Chi-square | 0.467701 | 2 | 0.7915 | 0.512067 | 2 | 0.7741 |

The importance of a healthy balance of payment to a country need not be overemphasized. Using Thirlwall’s

2. Conclusion and Recommendations

Law, this paper employed both quarterly and annual data to validate the importance of a positive balance of payment to growth in Nigeria. The study confirmed Thirlwall's law, that, no country can grow beyond the growth inherent in its balance of payment condition and that the growth rate of an economy equals the growth rate in the balance of payment calculated by the ratio of export growth rate and income elasticity of import. This shows that Nigeria is international trade-dependent and the activities in its balance of payments determine its growth.

The reality of this result can be further strengthened with the recent destructive activities that took place in the Niger Delta region of the country; the bombing of oil pipelines that saw to the decline in oil output thereby reducing total export contributed to Nigeria's decline into recession; a decline in export resulted in decline in growth. The import consuming nature in Nigeria is also obvious; this is revealed by the income elasticity of import which is greater than 100% or elastic using the annual data, both in the short run and long run.

Although, investigating import on quarterly basis, import is slightly income inelastic in the short and long run.

This study calls for monitoring of total imports and import contents. Nigeria has the capacity to produce majority of what it consumes; income elasticity of import shows that Nigeria consumes more than it produces, this may result in financing a form of everlasting debt. The government needs to enforce its recent directives to stop importation of some products that are produced within with higher quality, and adequate export promotion strategies must be formulated, executed and maintained. The import contents can be manufacturing sector oriented, so that they can be used in boosting production and thereby raise export growth.

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