Autoregressive Distributed Lag Analysis of International Trade and Economic Growth: Empirical Evidence from Kenya

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Abstract: Attainment of high and sustainable economic growth is one of the macroeconomic objectives countries endeavour to realise using different economic policies prescribed in their national development plans. Kenya has pursued trade policies that were aimed at stimulating long term growth since independence. Despite such policies, the current account balance has remained mostly negative for the past 40 years. Therefore, the study investigates the relationship between international trade and economic growth in Kenya for the period 1980-2015 using an Autoregressive Distributed Lag analysis. The study outcome is meant to add value to the empirical evidence on international trade and economic growth nexus. The results derived from the Autoregressive Distributed Lag Bounds test revealed that a long run relationship between international trade (exports and imports) and economic growth exists for the Kenyan economy. The unit root test performed using the Augmented Dickey Fuller test and the Phillip Perron test showed that the variables used in the analysis were all I(1) variables. The results also disclosed that imports and exports are positively and negatively related to economic growth respectively. The VAR Granger causality test on the other hand verified that the export–led growth, export – led import growth and the export led growth hypotheses hold for the Kenyan case.

Keywords: International trade, Economic growth, ARDL, Kenya

1. Introduction

The realisation of a high and sustainable economic growth is one of the macroeconomic objectives of every country. Hence through trade policy, economies can affect international trade and money flows which then shift the aggregate demand and aggregate supply of goods and services and in turn influence economic growth. International trade enable countries to consume outside their production possibility frontiers. Odhiambo & Otieno (2006) in Kumar & Pacheco (2012) holds that trade liberalisation and openness to international trade in Kenya have not clearly spelled out the long term path towards economic growth. Therefore, Kenyan policies should aim to improve openness to international trade if the enhancement and sustainability of long term growth is to be realised (Kumar & Pacheco, 2012). Hence this calls for an investigation of international trade and economic growth relationship in Kenya.

Based on literature review, it is revealed that some studies advocate for a positive relationship between international trade (imports and exports) and economic growth (Karras, 2002; Keong, Yusop, & Sen, 2005; Muhammad, 2012; Kim, Lin, & Suen, 2016). While other studies found a negative relationship between imports and economic growth (Keong, Yusop, & Sen, 2005; Khan, Salam, & Batool, 2015; Bastola & Sapkota, 2015). Similarly, some studies confirmed the existence of a bi-directional short run and lon run causality between international trade and economic growth (Ramos, 2001; Ugur, 2008; Hye, 2012; Hussain, 2014; Pradhan, Arvin, & Norman, 2015; Rahman & Mamun, 2016). Other studies supported a unidirectional causality running from international trade to economic growth (Olufemi, 2004; Islam, Hye, & Shahbaz, 2012; Muhoro & Otieno, 2014; Chatterji, Mohan, & Dastidar, 2014; Andrews, 2015; Abugamea, 2015; Saaed & Hussain, 2015). On the other hand a unidirectional causal relationship running from economic growth to international trade was also confirmed by empirical evidence (Ugur, 2008; Muhammad, 2012; Andrews, 2015; Saaed & Hussain, 2015). Some studies passed a no causality verdict (Hussain, 2014; Abugamea, 2015).

Irrespective of mixed outcomes as revealed by empirical evidence, mostly the international trade-economic growth nexus was explored in other countries other than Africa, especially Kenya. A single study conducted on Kenya only tested

the export-led growth hypothesis at the expense of import-led growth and the export-led import growth hypotheses. It is therefore the intention of this study to add to the strand of literature on international trade and economic growth from Kenya's point of view.

The study applies the Autoregressive Distributed Lag (ARDL) bounds testing technique and the VAR Granger causality technique to investigate the international trade and economic growth nexus in Kenya. The rest of the paper is organised as follows: Section 2 provides the review of theoretical and empirical literature of intermational trade (emports and imports) and economic growth. Section 3 outlines the empirical model, estimation techniques and data used in this study. In section 4 estimation results are reported and discussed. Finally, conclusions are drawn in Section 5.

2. Literature Review

According to the Ricardian-Heckscher-Ohlin model openness to international trade results mainly in a one-time increase in output without implications for long run growth (Eris & Ulsam, 2013). An efficient allocation of scarce resources is based on comparative advantage theory. Similarly, with the neoclassical model changes in trade policy solely influence the pattern of product specialisation and not the long term economic growth (Yiheyis & Musila, 2015). Hence, the Ricardian-Heckcher-Ohlin model and the neoclassical growth model have been improved by the introduction of endogenous growth models. The new growth theory explicitly incorporates the impact of openness to international trade. According to the endogenous growth theories changes in trade policy can now influence long term rates of economic growth (Yiheyis & Musila, 2015). Most empirical studies, including this paper, have based their research studies on new growth theory in order to determine international trade-economic growth relationship.

Karras (2002) detemined whether openness to international trade accelerated productivity and promoted economic growth by using a sample of 56 economies from the year 1950 to 1992. Empirical results derived from analysing a cross section yielded fragile and statistical insignificant outcome. But the employment of a complete panel and the fully utilisation of the time dimension of a panel data set produced both a positive and statistically significant relationship between openness and economic growth. Explicitly the results showed that a 10% increase in trade as a percentage of GDP leads to an approximately 0.5% permanent increase in economic growth.

When countries were differentiated as oil and non–oil countries Mehrara & Firouzjaee (2011) used the Granger causality technique to determine the relationship between oil/non-oil exports and economic growth. The analysis of 1970-2007 time series data of 73 developing countries from both bi and trivariate models confirmed a bi-directional long run causality between export and GDP growth for oil and non-oil exporting coutries. Using a bivariate model, the short term causality between export and GDP growth for non-oil was confirmed while that of oil countries was not.

Various forms of imports were analysed against GDP for the Turkish economy by Ugur (2008) for the period 1994:1 to 2005:4 using multivariate VAR analysis. Emprirical results from Granger causality test showed that a bi-directional causality between GDP and real investment goods import (IIMP) holds for Turkey. Also a uni-directional relationship between real GDP on real raw material import was also confirmed by the results. The accounting innovation results revealed that there is a bi-directional relationship between real GDP and both real investment goods import (IIMP) and real raw material import (RIMP). Also a uni-directional causality was confirmed running from real GDP to both real consumption goods import (CIMP) and other goods import (OIMP). But other studies only confirmed import-led growth hypothesis instead of the growth-led import supported by Ugur (2008) in order to reap international trade benefits.

Such benefits envisaged to arise from international trade were supported by Chatterji, Mohan & Dastidar (2014), who examined the empirical relationship between trade oppenness and economic growth in India for the period 1970 to 2010. The study used the Vector Autoregressive technique, the results indicated that growth in trade volumes speed up economic growth for the Indian economy for the years beyond 1980-81, that is, the pro-market regime period. The empirical results rendered the state-led growth model applied during pre-1980 ineffective for boosting economic growth.

Khan, Salam, & Batool (2015) studied the role played by agricultural raw material exports and the degree

of trade openness in stimulating economic growth of Pakistan for the period 1980 to 2013. This study employed the Vector Autoregressive (VAR) methodology to determine the relationship among the variables in the model. The existence of a long run association in the model was supported by empirical results. It was deduced from the normalised cointegration equation results that a 1% increase in the liberalisation of trade creates approximately 0.09% positive influence on GDP. While a 1% increase in agricultural raw material exports stimulate approximately 0.10% positive impact on gross domestic product. But a 1% increase in imports yields approximately -3.6%, a negative impact on gross domestic product growth for the Pakistan economy.

Another study in Pakistan by Muhammad (2012) investigated the impact of trade openness on economic growth in the long run yielded intra-contradictory results. The ARDL bounds testing technique and the Granger causality test (complemented by innovative accounting methods) were applied to test for the existance of a long run relationship and causality among the variables respectively. The emprical results confirmed that the series was cointegrated. It was also found that trade openness promoted economic growth in the long run but the growth-led trade was supported by VECM Granger causality test results.

Since the causes of economic growth in India and other countries were not well understood, Pradhan, Arvin, & Norman (2015) used ARDL bounds testing technique together with the VECM to determine the dynamic linkages between growth, trade openness and financial sector depth. The results confirmed that the variables were cointegrated and hence the existance of a long run relationship was justified. Furtermore the results confirmed the existance of a bi-directional causality between trade openness and economic growth for the Indian economy. As a policy prescription, the results suggested that international trade can be encouraged in order to accelerate and maintain sustainable economic growth in the long term.

Rahman & Mamun (2016) investigated the existence of trade led growth and other options in Australia by employing an ARDL bounds testing approach of cointegration, the Granger Causality test and the impulse response functions covering years 1960 to 2012. The research findings confirmed a bi-directional causality between international trade and per capita GDP growth. Hence the study provided evidence in support of the trade-led growth hypothesis for the Australian economy.

The Australian study outcome was further extended by Kim, Lin & Suen (2016) who employed the Cross Sectionally Augmented Autoregressive Distributed (CS-ARDL) panel data technique to investigate the trade with economic growth and growth volatility relationships. The research results revealed that international trade promotes economic growth, increase long run growth volatility and simultaneously promotes a positive long run relationship between growth and growth volatility. Therefore the stimulation of economic activities through the promotion of international trade in the short run dampens economic fluctuation on average. The moderation of economic fluctuation causes an inverse short run correlation between growth and growth volatility to hold.

A study by Olufemi (2004) on the Nigerian economy used Granger causality to investigate the causal relationship between the openness variable and economic growth covering 1970 to 2000. The research study applied various forms of trade openess as proxies in the model. The empirical results confirmed a uni-directional relationship running from trade opennes to economic growth. It was concluded that for an increased level of openness to be beneficial to the Nigerian economy, it should be dependent on the level of economic development. Hence the Nigerian economy needs to attain a certain threshold with respect to economic growth for the trade openness benefits to be realised in full.

Other studies used exports or imports or both to determine the international trade-economic growth relationship. Such studies include Keong, Yusop, & Sen (2005) among others, who applied the bounds testing procedure to test the validity of the export-led growth hypothesis for Malaysian economy for the years 1960 to 2001. Empirical results revealed that exports and economic growth were cointegrated. Also exports accelerated economic growth but imports influenced economic growth negatively. The conclusion was that export-led growth hypothesis hold for the Malaysian economy.

The negative import-economic growth relationship was also confirmed by the Nepalese time series data. In this case Bastola & Sapkota (2015) employed the ARDL bounds testing approach and the trivariate

Johansen method to investigate the causal relationship between real GDP, exports and imports. The outcome of the time series analysis from 1965-2011 revealed that the estimated long run parameters were stable overtime. A uni-directional causality running from export to GDP was detected both in the short and long run. This result confirmed that the export-led hypothesis holds for the Nepalese economy. But a negative causality running from imports to economic growth was established. The long run estimates showed that there is a significant negative influence of imports on gross domestic product. The conclusion was that economic policies could be implemented in an effective manner in order to spur exports and simultaneously maintain a healthy trade balance in order to boost growth.

Another study by Hye (2012) investigated the export-led growth, growth-led export, import-led growth and growth-led import using the Modified Granger causality test and the ARDL bounds testing approach for China coverings the years 1978 to 2009. The results confirmed the existence of a bi-directional long run relationship between economic growth and exports, economic growth and imports, and exports and imports. Therefore the results confirmed that the tested hypothesis are valid for China. The long run elasticities derived from the study showed that the responsiveness of economic growth to exports (0.591) and imports (0.621) and that of imports to imports (0.975) indicated an inelastic relationship among the variables. Whilst the responsiveness of exports to economic growth (1.635), imports to economic growth (1.392) and exports to imports (1.322) revealed an elastic relationship.

Hye's (2012) outcome was also partially confirmed at a country level by Ramos (2001) who investigated the causal relationship among the export-import and economic growth nexus by using Portugal data covering 1865 to 1998. Imports were considered to play a critical role in the nexus. Hence the inclusion of imports in the nexus empowered the study to test for the direct, indirect and spurious causality between export growth and output growth. The empirical findings confirmed a bi-directional causality between export-output growth and import-export growth. In the same realm Hussain (2014) examined the causal relationship between economic growth, exports and imports using Granger causality and cointegration tests over the years 1976 to 2011 in Pakistan. The results indicated that variables were stationary at 1st difference. The Johansen and Juselius cointegration test results showed that exports, imports and economic growth were not cointegrated. But Granger causality results confirmed the existance of a bi-directional causality between GDP and exports. On the other hand no causality was empirically deduced between exports and imports.

In the long run the bi-directional relationship was also tested by Tsegaye (2015) who examined the trade-economic growth nexus in South Korea by analysing the Cobb-Douglas production function using the VECM and Granger causality. The analysis of 1960 - 2010 time series data confirmed a unidirectional long run causality between exports and economic growth. A bi-directional long run causality between imports and economic growth was also confirmed. With respect to the short run, a casual relationship was found running from exports and imports to economic growth. Such a result validated the applicability of both the export-led growth and the import-led growth hypothesis for the South Korean economy. The paper also indicated that an integrated policy mix could be used to influence exports and imports in order to stimulate sustainable economic growth. The paper concluded that policies aimed at driving exports only may not be as effective in growing the South Korean economy.

The existance of bi-directional causality could not hold for Palestine when Abugamea (2015) employed both the cointegration and Granger causality tests to determine the long run and the short run export-import-economic growth relationship. The VECM results derived from the analysis of 1968 to 2012 time series data confirmed a long run relationship of the nexus. The results showed that imports Granger cause variations in economic growth in the long run and not in the short term. Despite the fact that both exports and imports are considered to be of utmost importance in the nexus, Granger causality failed to show any causality among exports, imports and economic growth.

A cross country study qualified the causal relationships according between low and high income countries. Islam, Hye, & Shahbaz (2012) applied also the ARDL bounds testing methodology and Granger causality to determine long run relationship and both long run and short run relationships for 62 countries from 1971 to 2009. The study revealed mixed results. Higher income countries were

associated with the unidirectional long run causality running from import to economic growth. An exception was with respect to USA, Iceland and Italy, whose data whose data showed the importance of economic growth as a source of imports. While a bi-directional long run causality was found to exist between imports and economic growth for low income countries, with the exception of Madagascar and Mauritania.

Muhoro & Otieno (2014) tested the export-led growth hypothesis which advocates that export growth is instrumental in driving economic growth. The claim was investigated by applying a seven variable ARDL bounds testing model and a 2 Stage Least Squares technique on the Kenyan annual time series data covering years 1976 to 2011. The emprical results confimed that a unidirectional causality running from exports to economic growth holds for Kenya. Such an outcome supports the export-led growth hypothesis in the short run. Therefore the study recommended that the implementation of export enhancement policies that leads to the improvement of export quantity, quality and value which inturn increases the ability to promote sustainable economic growth. But use of a bivariate (exports and economic growth) instead of a multivariate (exports, imports and economic growth) may not be as effective in growing the Kenyan economy.

In addition to other findings, the export-led growth hypothesis was not confirmed by Saaed & Hussain (2015) who investigated the effect of exports and imports on economic growth in Tunisia for years 1977 to 2012. The study applied both the Granger causality and Johansen cointegration methodology to determine both short run and long run relationships. The findings showed that economic growth Granger cause imports and exports while exports cause imports. The study concluded that the Tunisian economic growth could be accelerated by the adoption of the growth-led import strategy and complemented by the export-led import strategy. The study also highlighted that imports could be regarded as a critical source of economic growth for the Tunisian economy.

In an African setting, the confirmation of the bi-directional relationship was also complemented by other tested claims when Andrews (2015) used Granger causality to determine the export-import-economic growth relationship for Liberia. Using the 1970-2011 time series data the import variable was placed under investigation as the paper explored the export-output causality. Such emphasis reinforced the testing of direct, indirect and spurious causality between export growth and output growth. The empirical results exposed that imports Granger cause both GDP and exports. Overall the results showed that there is a bi-directional causality between imports and GDP while a uni-directional relationship was revealed with respect to exports on GDP and imports on exports. The study concluded that Liberia's economic growth is driven by a mixture of exports and exports, while imports are said to have a greater impact in the long run. In order to have a greater impact on both local and export market, the optimal strategy could be to implement the export-led strategy in the short term and import substitution strategy in the long term.

3. Research Method

The study investigates the international trade (exports and exports) and economic growth relationship in Kenya by employing the Autoregressive Distributed Lag (ARDL) bounds testing technique. Other econometric testing procedures are used to augment the ARDL methodology. Such methods like the Augmented Dickey fuller unit root test and Phillips Perron unit root test are used to check for stationarity and order of cointegration. The ARDL bounds test technique is initially applied to determine the existence of a long run relationship in the model. After the justification of the presence of cointegration in the model, the ARDL analysis is conducted to determine both short run and long run relationships in the model. Finally, the diagnostic tests are then used to verify the reliability of results obtained.

3.1 Data and Model Specification

The data analysed for the Kenyan economy was acquired from the World Economic Outlook and IMF International Financial Statistics data bases for the period 1980 to 2015. The empirical study utilises the economic growth model of the form:

$$LNGDP = f(LNM, LNM) \tag{1}$$

Equation 1 is then expressed as a linear multiple regression equation shown as follows:

$$LNGDP_t = \beta_0 + \beta_1 LNX_t + \alpha_2 LNM + \upsilon_t \tag{2}$$

Where: $LNGDP_t$ = log of Gross Dom^stic Product at time t, a proxy of economic growth

LNX_t = log of exports at time t

LNM_t = log of imports at time t

β_0 , $\beta_1 \beta_2$ = model coefficients of elasticity

υ = epsilon which represents a random variable called the error term

Then the ARDL approach to cointegration applied in the study using unrestricted error correction model (Klasra, 2011) is represented as follows:

$$\Delta LNGDP = \varphi_0 GDP + \sum_{i=1}^{n} b_{iGDP} \Delta LNGDP_{t-i} + \sum_{i=1}^{n} c_{iGDP} \Delta LNX_{t-i} + \sum_{i=1}^{n} d_{iGDP} \Delta LNM_{t-i} + \psi_{1GDP} LNGDP_{t-1} + \psi_{2GDP} LNX_{t-1} + \psi_{3GDP} LNM_{t-1} + \gamma_{1t} \quad (3)$$

Where Δ represents the first difference operator. The F test is then used to determine the long run relationship between the variables by testing the significance of the lagged levels of the variables (Klasra, 2011). The null hypothesis derived according to Pesaran & Shin (1999) can be shown as:

$$H_0 : \psi_{1GDP} = \psi_{2GDP} = \psi_{3GDP} = 0$$

Which is tested against the alternative hypothesis

$$H_0 : \psi_{1GDP} \neq \psi_{2GDP} \neq \psi_{3GDP} \neq 0$$

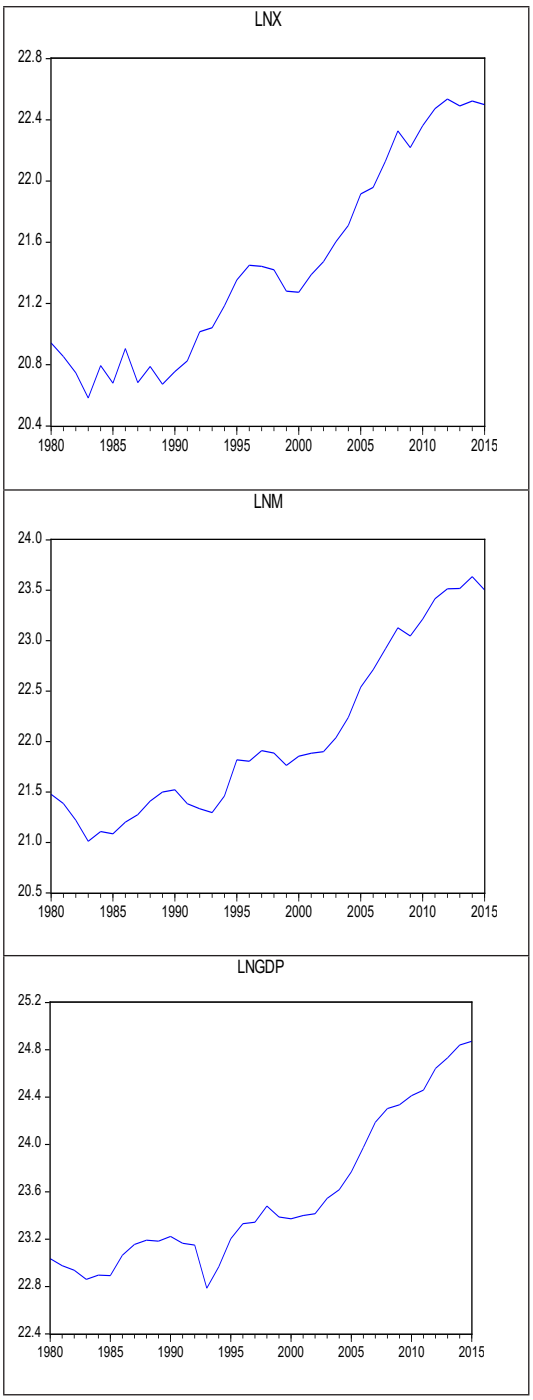
4. Empirical Results and Discussion

4.1 Unit Root Tests

In testing for unit root this study firstly considered the graphical approach, Figure 1 shows the respective variables LNX (exports), LNM (imports) and $LNGDP$ (economic growth as proxy) in levels. Given that their time series graphs are not hovering around their respective means this is an indication that the time series are not stationary in levels.

When time series variables are differenced once, $DLNX$ (exports), $DLNM$ (imports) $DLNGDP$ (economic growth) seem to be stationary as shown in Figure 2 on the next page. The differenced time series appear to oscillate around the mean. Therefore, using the graphical approach the outcome is not

Figure 1: Time Series in Levels

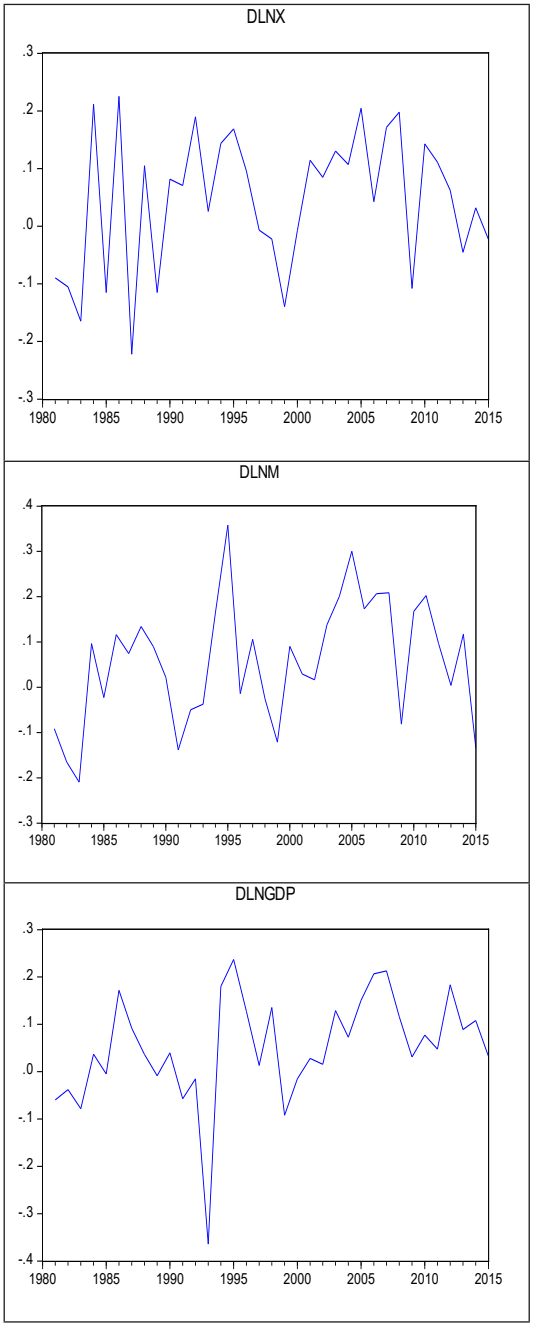


Source: Authors

conclusive, hence more robust techniques need to be applied on the Kenyan time series data. The more readily applicable techniques are the ADF and the PP tests to derive more efficient and reliable outcome of unit root tests.

Table 1 on page 152 shows the unit root test results obtained after applying the ADF and the PP unit root testing procedures. The unit root test results show that variables LNX (exports), LNM (imports)

Figure 2: Time Series in 1st Difference



Source: Authors

and LNGDP (economic growth) are non-stationary or (contains a unit root) in levels. When the series are differenced once all the variables become stationary at least at 1%, 5%, and 10%. This implies that all variables are integrated of order one [I (1)]. Given the order of integration of [I (1)], both ARDL bounds testing technique and VECM are applicable. Klasra (2011) holds that the ARDL bounds testing methodology is superior to the Johansen cointegration technique in that, ARDL bounds testing gives more efficient results with small samples (36 observations) and it can also test for the presence of cointegration irrespective of whether regressors are [I(0)], [I(1)] or mutually cointegrated (Klasra, 2011).

5. ARDL Cointegration Tests: Short Run and Long Run Form

In Table 2, on the following page, the empirical results of the bounds cointegration test reveal that the null hypothesis of no existence of long run is rejected at 2.5% level of significance. The rejection is based on the fact that the F-statistic value (4.971119) is greater than the lower critical bound value of 4.41. Therefore, the existence of a steady state long run relationship exists between $LNGDP$ (economic growth), LNX (exports) and LNM (imports) (Atif *et al*., 2010).

The estimated coefficients derived from the long run relationship between $LNGDP$, LNX and LNM in Table 3 are represented in the equation 4:

$$LNGDP_t - (1.014287LNM_t - 0.304773\mathrm{LNX}_t + 7.770385) = 0 \quad (4)$$

Making $DLNGDP_t$ the subject of the formula, equation 4 becomes:

$$LNGDP_t = -7.770385 + 0.304773\mathrm{LNX}_t - 1.014287LNM_t \quad (5)$$

Equation 5 above and Table 3 on page 153, show that exports (LNX) are positively related to economic growth ($LNGDP$). An elasticity coefficient of 0.3048 between exports and economic growth implies that a 1% increase in the level of exports (LNX) leads to a 0.3048% increase in economic growth. The export-economic growth relationship is inelastic indicating that the variation in economic growth is less responsive to changes in exports. On the other hand imports (LNM) are negatively related to economic growth ($LNGDP$). The import-economic growth relationship is elastic and negative meaning that a 1% increase in imports leads to a 1.0143% reduction in economic growth. Exports are statistically significant at 10% level while imports are significant at 1% level which indicates their relative importance in the economic growth model. The results indicate that in the long run, export led hypothesis holds for the Kenyan economy.

Table 3 also reveals the short run results and of particular interest is the speed of adjustment (-0.572173) with the expected priori sign and

Table 1: Augmented Dickey Fuller (ADF) and the Phillips Perron Unit Root Test Results

Series	Model	ADF Lags	ADF Statistic	PP Bandwidth	PP Statistic	Conclusion & Order of Integration
LNGDP	τ_τ	0	-1.490312	3	-1.558119	Do not reject H_0: Series contains unit root, (= series not stationary), I(1)
	τ_μ	0	1.352089	4	1.353853	
	τ	0	2.781003	0	2.781003	
DLNGDP	τ_τ	0	-4.975597***	7	-5.202943***	Reject H_0: Series contains unit root, (= it's stationary)
	τ_μ	0	-4.624340***	3	-4.591511***	
	τ	0	-3.931695***	1	-3.889645***	
LNM	τ_τ	0	-2.647128	1	-2.619582	Do not reject H_0: Series contains unit root, (= series not stationary), I(1)
	τ_μ	0	0.941022	2	0.604724	
	τ	0	2.584295	2	2.083701	
DLNM	τ_τ	0	-3.954839**	0	-3.954839**	Reject H_0: Series contains unit root, (= it's stationary)
	τ_μ	0	-3.910917***	1	-3.852658***	
	τ	0	-3.449554***	3	-3.485464***	
LNX	τ_τ	0	-3.125446	1	-3.147529	Do not reject H_0: Series contains unit root, (=series not stationary), I(1)
	τ_μ	0	0.394167	1	0.529983	
	τ	0	2.184068	0	2.184068	
DLNX	τ_τ	0	-6.827278***	9	-6.827278***	Reject H_0: Series contains unit root, (= it's stationary)
	τ_μ	0	-6.630688***	8	-6.627490***	
	τ	0	-5.726070***	1	-5.832432***	

H_0: There is unit root
** mean significant at 10%, ** imply significant at both 5% & 10% and*
**** indicate significant at 1%, 5% & 10%.*

Source: Authors

Table 2: ARDL Cointegration Test results:

ARDL Bounds Test Date: 01/04/17 Time: 02:28 Sample: 1981 2015 Included observations: 35 Null Hypothesis: No long-run relationships exist		
Test Statistic	**Value**	**k**
F-statistic	4.971119	2
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Source: Authors

significant at 1% level. The negative value of the speed of adjustment indicates that the system will converge to an equilibrium, hence the model is valid. The speed of adjustment also indicates that 57.22% of the disequilibrium in the previous year is corrected toward the steady state long run equilibrium in the following year. The validity of the model is also confirmed by Figure 3 which reveals that from 20 top models (based on Schwarz criteria) both the long run and the short run results in Table 3 where estimated using the best model ARDL (1,0,0). Hence the results in Table 3 are more efficient as compared to the outcome of other 19 possible models.

6. VAR Granger Causality Test Results

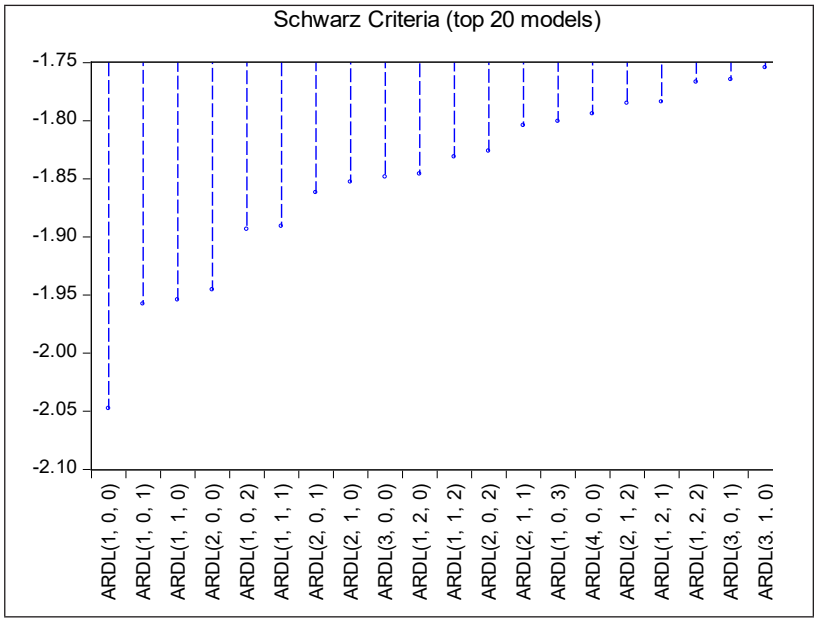
Table 4 reports the VAR Granger causality test results. The null hypotheses; lags of *LNGDP* do not Granger cause *LNX* or *LNM*, lags of *LNX* do not Granger cause *LNGDP* or *LNM* and lags of *LNM* do not Granger cause *LNX* or *LNGDP* is rejected at 1%, 5% and 10% according to the criteria used by other studies (Lean & Smyth, 2010). The results show that exports (*LNX*-lags 1 to 2) jointly Granger cause economic growth (*LNGDP*) and imports (*LNM*) while imports (*LNM*-lags 1 to 2) Granger cause economic

Table 3: ARDL Cointegrating and Long run results:

ARDL Cointegrating and Long Run Form Dependent Variable: *LNGDP* Selected Model: ARDL(1, 0, 0) Date: 01/04/17 Time: 02:29 Sample: 1980 2015 Included observations: 35				
Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(*LNM*)	0.580348	0.127975	4.534847	0.0001
D(*LNX*)	-0.174383	0.109145	-1.597724	0.1202
CointEq(-1)	-0.572173	0.096739	-5.914613	0.0000
Cointeq = *LNGDP* - (1.0143*LNM -0.3048*LNX + 7.7704)				
Long Run Coefficients				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LNM	1.014287	0.134058	7.566052	0.0000
LNX	-0.304773	0.174811	-1.743448	0.0912
C	7.770385	1.094377	7.100281	0.0000

Source: Authors

Figure 3: Top 20 Applicable Models Based on Schwarz Criteria



Source: Authors

growth. The results support only a unidirectional causality among significant relationships. The results support the ARDL cointegrating and the long results shown in Table 3 above.

7. Conclusion

This paper investigated the relationship between international trade (imports and exports) and economic growth of Kenya from the period 1980 to 2015. The study's outcome is meant to add to the diverse empirical evidence on the international trade-economic growth nexus from the Kenya's point of view. The Augmented Dickey Fuller and Phillips Perron unit root tests reveal that the time series variables are stationary at 1st difference, hence they are integrated of order I(1). Empirical results derived from the ARDL analysis justify the

Table 4: VAR Granger Causality Test Results

	LNGDP	LNX	LNM
Dependant Variable			
LGDP	-	5.822604* (0.0544)	11.66077* (0.0029)
LNX	0.190043 (0.5516)	-	1.182438 (0.5537)
LNM	0.964616 (0.6174)	7.962137** (0.0187)	-
*, **, ***, represents statistical significance at 10%, 5%, 1% and figures in parentheses are *p*-values			

Source: Authors

existence of cointegration among the variables. The ARDL cointegrating and long run results confirm that exports and imports are positively and negatively related to economic growth respectively. The VAR Granger causality test results show that there is a causal relationship running from exports to economic growth and imports and imports to economic growth. The empirical results seem to support export-led growth, export-led import growth and import-led growth. This is in line with the work of Muhoro & Otieno (2014) and Tsegaye (2015) who also confirmed the export-led growth hypothesis. Given a negative import-economic growth relationship, Kenyan economy can apply an integrated policy mix aimed at influencing exports and a preferential array of imports in order to spur economic growth.

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