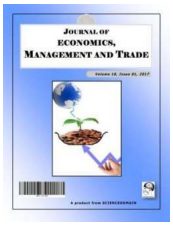

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Trade-led Growth and Growth-led Trade Hypotheses in Bangladesh: An ARDL Bounds Test Approach

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study investigates the relationship between foreign trade and economic growth using annual data of real GDP (proxied for economic growth), real exports and imports for the period of 1979 to 2014 in Bangladesh. The study operates the bounds testing cointegration procedure and ARDL-error correction model to examine the short-run and long-run relationships among the variables. The ARDL bounds test approach reveals that the long run cointegrations exist among the variables when GDP is dependent on export and import, and export is dependent on GDP and import. The long run coefficients of ARDL results show that export is positively and import is negatively related with GDP at 1% level of significance. Furthermore, GDP and import have a positive and highly significant long-run effect on export in Bangladesh. The short run dynamics along with the error correction term (ECT) results indicate that the coefficients of error correction terms of the two models are negative and highly significant which suggesting that the long run causalities are also directing from exports and imports to GDP, and GDP and imports to exports. The error correction terms imply that GDP requires about ten years to converge to equilibrium after being shocked, while export requires only about nine months. All of the short run coefficients of the models are significant and consistent with

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the long run results signifying that export-led growth, growth-led export and import-led export models are valid in Bangladesh. Although the role of imports on economic growth is negative, imports perform a noteworthy role to promote exports in Bangladesh both in the short run and long run. In conclusion, we can comment on this empirical study that trade liberalization which has been started in 1979 significantly benefits the economic growth in Bangladesh.

Keywords: Foreign trade; economic growth; export-led growth; import substitution policy; vector error correction model.

1. INTRODUCTION

Foreign trade is one of the old areas of economic thought. From the ancient times to the present export and import have been remained a great concern for the policymakers of a country. The relationship between foreign trade and economic growth has been lingered a debated topic from the perspective of the issue of import substitution versus export promotion policies. Since the time of the ancient Greek philosophers, there has been a dual view of trade; however, most economists have concluded that the overall benefits to society are substantial [1]. The first organized thought named mercantilism developed in seventeenth and eighteenth century Europe. Mercantilists believed that trade surpluses enriched a country and they showed a preference for exports over imports. Classical economists, such as, Adam Smith and David Ricardo opposed mercantilism by arguing that imports, as well as exports, promote economic growth. The structure school led by Lewis introduced a dual economy model and argued that if the industry sector produces exporting goods and the agricultural sector produces importing goods, foreign trade would undoubtedly expand the market and economic growth [2]. Romer, Lucas and Svensson, the representatives of new-growth school argued that international trade can promote economic growth through technology spill over and external stimulation (as cited in [2]). However, agreeing with the basics of macroeconomics, import is frequently accepted as a leakage of revenue which will lead to unemployment rather than economic growth. Based on this assumption, [2] argues that the research on the relationship between economic growth and foreign trade can be taken to prove the assumptions of export-led economic growth. However, it goes without saying that the success of most export industries in Bangladesh massively depends on the import of machinery and raw materials. Thus, including both export and import to test the trade-led growth hypothesis and vice versa in Bangladesh perspective certainly overcome the omitted variable bias or misspecification error. The relationship between exports, imports and economic growth is investigated in many studies. The researchers find four kinds relations of exports and imports with economic growth [3]. First, export-led and import-led economic growth. Second, growth-led exports and imports. Third, bidirectional relations between foreign trade and economic growth. Fourth, there is no causal relation between foreign trade and economic growth. Exports are an important source of income and an engine of growth, so a large body of studies, such as, [4,5,6] reveal that there exist a positive and strong relation between exports and economic growth. A few studies in Bangladesh perspective, such as, [7,8,9,10] find the evidence of export-led growth; however, [11,12] find no evidence of a relationship between exports and economic growth. Reference [13] explores that there is long-run and short-run causality running from income to exports in Bangladesh over the 1972-2000 period, while [14] explores that the short-run causality is bidirectional but economic growth causes imports in the long run in Bangladesh. Reference [15] examines trade-growth nexus using data from six South Asian countries, named, Pakistan, Bangladesh, India, Sri Lanka, Nepal and Bhutan employing ARDL approach. They find that the export-led growth model is relevant to all countries except Pakistan, while the import-led growth model is relevant to all countries. The growth-led export model applies to all countries except Bangladesh and Nepal, while growth-led import and export-led import models are relevant for all countries. The above mentioned inconclusive empirical findings from the researchers are motivated us to consider this study in Bangladesh perspective.

Bangladesh, once known as the bottomless basket in the 1970s, is now appreciated as an emerging economy. Foreign trade performs a notable task in the economy of Bangladesh. In 1972, the volume of real GDP, export and import were 17.37, 0.41 and 6.7 billion dollars respectively, while in 2014, the volumes have been increased to 118.89, 23.57 and 26.78 billion dollars respectively [16]. During the first

decade of the 21st century, the average economic growth rate has been approached 6 percent per annum. The average real growth rates of export, import and GDP in Bangladesh have been 11.98%, 6.81% and 4.71% respectively throughout the 42 years from 1972 to 2013. Real export and import have been recorded the highest growth of about 86% and 85% respectively in 2004. After its independence on 16 December 1971, the first government of sovereign Bangladesh taken up a commanding economic policy and the resulting trade controls were substantial during the period of 1972 to 1975. This is why average real growth rate of import in Bangladesh was -5.14% during 1973 to 1979. Bangladesh gradually started to move towards privatization and the market economy as a result of a new government after 1975. In 1979, Bangladesh inaugurated a managed exchange rate to stimulate exports in particular and the export promotion bureau was modified to explore new areas of trade [10]. Hence, the year of 1979 can be viewed as a beginning of trade liberalization in Bangladesh (as cited in [10]). Bangladesh is an import dependent country. Even the success of export industries including the readymade garments also depends on the import of machinery and raw materials. Since the growth rate of the economy with free trade regime is higher than the closed regime and taking into consideration the above facts, this study aims to explore the foreign trade-led growth hypothesis and vice versa in Bangladesh during the liberalized trade regime from 1979 to 2014.

This study may add some contributions to the limited study in Bangladesh perspective as it considers the impacts of both imports and exports on economic growth and vice versa. It also selects the appropriate foreign trade liberalized regime from 1979 to 2014 since it captures the true impact of foreign trade on economic growth. Most of the previous studies in this issue in Bangladesh perspective are used Johansen cointegration and Vector Error Correction Model (VECM). This paper may lead the way for Bangladesh perspective attempting to use a recent econometric model, named, Autoregressive Distributed Lag (ARDL) bounds test approach to testing the cointegration and causality among exports, imports and economic growth in Bangladesh. The study is organized into four sections as follows: Section 2 presents the data and methodology; Section 3 reports the findings, and Section 4 concludes the study.

2. METHODOLOGY

2.1 Data and Data Sources

This study uses annual data on real GDP (proxied for economic growth), real exports and real imports over the period from 1979 to 2014. The data on real GDP (Y), exports (X) and imports (M) at constant US dollar 2005 price are collected from World Development Indicators, 2015 published by World Bank. As discussed earlier, we select the sample period from 1979 to 2014 as the trade liberalization in Bangladesh has been started in 1979; however, it has been gotten pace in the early 1990s. All the data are transformed in logarithmic form as this transformation reduces the problem of heteroscedasticity [17].

2.2 Research Methods

Modern econometrics methods are employed in this study to asses the impact of export and import on economic growth and vice versa. Descriptive statistics are used to provide a general understanding of the empirical features of the variables incorporated in this study. Unit root tests are employed to test the stationarity properties of the variables. The study operates the bounds testing cointegration procedure introduced by Pesaran, Shin and Smith in 2001 [18] and ARDL-error correction model (ECM) to examine the short run and long-run relationship among the variables.

2.2.1 Unit root test

An examination that may verify the order of integration of the variables is referred to as unit root test. Unlike Johansen and Juselius [19] cointegration technique, the ARDL bounds testing cointegration procedure does not require the same order of integration for each variable. ARDL model is applicable irrespective of whether the regressors in the model are purely I(0) or purely I(1) or mutually cointegrated. However, in order to run ARDL framework, some preconditions need to be checked, such as, dependent variable must be non-stationary in order for the model to behave better and none of the variables should be I(2). Consequently, two extensively used unit root test, namely Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) test are employed to examine the stationarity of the time series. The ADF test is performed using the following equation:

$$\Delta Y_t = \alpha + \beta T + \gamma \Delta Y_{t-1} + \delta_i \sum_{i=1}^{m} \Delta Y_{t-i} + \varepsilon_t \quad (1)$$

where, α is an interecpt (constant), β is the coefficient of time trend T. γ and δ are the parameters where, γ = ρ-1, ∆Y is the first difference of Y series, m is the number of lagged first differenced term, and ε is the error term.

Phillips and Perron unit root test is performed using the following equation:

$$\Delta Y_t = \alpha + \beta T + \gamma \Delta Y_{t-1} + \varepsilon_t \quad (2)$$

where, α is a constant, β is the coefficient of time trend T, γ is the parameter and ε is the error term.

2.2.2 ARDL bounds test

In examining the trade-led growth hypothesis, we have utilized the ARDL bounds test approach sequentially developed by Pesaran and Pesaran in 1997 [20], Pesaran and Shin in 1999 [21] and Pesaran, Shin and Smith in 2001 [18]. ARDL bounds test procedure is adopted as it is relatively more efficient and performs better in small data sizes as in the case in this study, while Johansen and Juselius cointegration model requires larger samples for the results to be valid [21]. Furthermore, the ARDL method simultaneously assesses the short-run and the long-run properties of the variables and it also provides unbiased estimates of the long-run model. The long-run models can be expressed mathematically as:

$$Y_t = \alpha_1 + \beta_1 X_t + \beta_2 M_t + \varepsilon_{1t} \quad (3)$$

$$X_t = \alpha_2 + \beta_3 Y_t + \beta_4 M_t + \varepsilon_{2t} \quad (4)$$

$$M_t = \alpha_3 + \beta_5 Y_t + \beta_6 X_t + \varepsilon_{3t} \quad (5)$$

where Y is GDP, X is exports and M is imports. α_i are intercept terms, β_i are the coefficients and ε_i are the error terms.

As in [10], equation (3), (4) and (5) can be written in the following conditional error correction model (ECM) version of the ARDL owing to implement the bounds testing procedure:

$$\Delta Y_t = c_1 + \pi_1 Y_{t-1} + \pi_2 X_{t-1} + \pi_3 M_{t-1} + \sum_{i=1}^{\rho} \theta_i \Delta Y_{t-i} + \sum_{i=1}^{\rho} \emptyset_i \Delta X_{t-i} + \sum_{i=1}^{\rho} \delta_i \Delta M_{t-i} + u_{1t} \quad (6)$$

$$\Delta X_t = c_2 + \pi_1 X_{t-1} + \pi_2 Y_{t-1} + \pi_3 M_{t-1} + \sum_{i=1}^{\rho} \theta_i \Delta Y_{t-i} + \sum_{i=1}^{\rho} \emptyset_i \Delta X_{t-i} + \sum_{i=1}^{\rho} \delta_i \Delta M_{t-i} + u_{2t} \quad (7)$$

$$\Delta M_t = c_3 + \pi_1 M_{t-1} + \pi_2 Y_{t-1} + \pi_3 X_{t-1} + \sum_{i=1}^{\rho} \theta_i \Delta Y_{t-i} + \sum_{i=1}^{\rho} \emptyset_i \Delta X_{t-i} + \sum_{i=1}^{\rho} \delta_i \Delta M_{t-i} + u_{1t} \quad (8)$$

where equation (6), (7) and (8) are termed as model 1, 2 and 3 respectively. The first parts of the above equations represent the long-run dynamics of the models and the second parts show the short-run relationship in which Δ signifies the first difference operator. c_i(i = 1..3) show constants, π_i (i = 1..3) denote coefficients on the lagged levels, θi, ϕ_i and δ_i (i = 1…ρ) denote coefficients on the lagged variables, and finally u_i(i = 1…3) stand for error terms. ρ signifies the maximum lag length, which is decided by the Akaike Information Criterion (AIC). The Schwartz Bayesian Information Criterion (SBC) and Akaike Information Criterion (AIC) are two main lag length criteria popularly used to select the maximum lag length in autoregressive models. The Akaike Information Criterion (AIC) is utilized in this study to determine the order of the ARDL model as it has a lower prediction error than that of the SBC based model [22].

The ARDL bounds test method consists of two steps for estimating the long-run relationship [18]. The first step is to inspect the presence of long-run relationship among all variables in the equations. The second step is to estimate the long run and short-run coefficients of the same equation. Thus, we estimate the equations (6) to (8) in order to test the long-run relationship by conducting F-test for the joint significance of the coefficients of the lagged levels of the variables. The null and alternative hypotheses are as follows:

H_0 : $\pi_1 = \pi_2 = \pi_3 = 0$ (No long run relationship)

H_1 : $\pi_1 \neq \pi_2 \neq \pi_3 \neq 0$ (Long run relationship exists)

Two sets of critical values for a given significance level can be determined [18]. The first level is calculated on the assumption that all variables incorporated 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 accepted if the F-statistic is lower than the lower bounds value. Other ways, the cointegration test is inconclusive.

Finally, we perform diagnostic and stability tests to establish the goodness of fit for the ARDL models. The diagnostic tests include the serial correlation, normality and heteroscedasticity associated with the models. The stability tests are conducted by operating the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ).

3. EMPIRICAL RESULTS

3.1 Descriptive Statistics

Table 1 presents the summary statistics including mean, minimum and maximum values, standard deviation, kurtosis, skewness, and Jarque-Bera test for data under consideration in their log levels.

We can observe that standard deviation of X is higher than the other variables. It means the volume of export is more volatile compared to other variables. The positive skewness values of the variables suggest that all Y, X and M are skewed to the right. The kurtoses of macroeconomic variables are less than 3, which indicate that the distributions are platykurtic. The calculated Jarque-Bera statistics and P-values in Table 1 are used to test the null hypothesis for normal distribution (H_0: Yearly distribution is normally distributed). The P-values associated with Jarque-Bera statistics reveal that the null hypothesis is accepted for all the variables meaning that they are normally distributed.

3.2 Unit Root Test Results

Considering the results of ADF and PP tests (Table 2), it is clearly evident that the null hypothesis of a unit root at the level are accepted in all cases as test statistics are lower than the critical values. Therefore, we conclude that all series are nonstationary in levels. Results from the ADF and PP tests also show that all series are stationary in first differences with 1% significance level. So, all the individual series are found to be integrated of order one, i.e., I(1). Since none of the variables are I(2) which is the basic requirement for the ARDL approach, we proceed to apply the ARDL bound testing method.

Table 1. Statistical features of the variables in log level

Statistics	Y	X	M
Mean	24.59	21.80	22.29
Median	24.55	21.59	22.09
Maximum	25.50	23.88	24.01
Minimum	23.86	20.31	21.16
Std. Dev.	0.49	1.24	1.01
Skewness	0.24	0.43	0.53
Kurtosis	1.86	1.71	1.77
Jarque-Bera	2.28	3.58	3.98
Probability	0.32	0.17	0.14
Observations	36	36	36

Table 2. ADF and PP unit root test results of the variables

	Y	∆Y	X	∆X	M	∆M
			ADF			
Intercept	4.76 (1.00)	-5.57* (0.00)	1.17 (0.99)	-4.31* (0.00)	0.46 (0.98)	-6.02* (0.00)
Trend & intercept	-0.57 (0.97)	-8.76* (0.00)	-3.27 (0.08)	-4.63* (0.00)	-2.67 (0.26)	-6.73* (0.00)
			PP			
Intercept	6.37(1.00)	-5.67* (0.00)	0.99(0.99)	-4.31* (0.00)	0.46(0.98)	-6.02* (0.00)
Trend & intercept	-0.57(0.97)	-8.76* (0.00)	-3.27(0.09)	-4.65* (0.00)	-2.67(0.26)	-6.73* (0.00)

*Notes: First bracket shows P-values. * indicates stationary at 1% level using MacKinnon (1996) critical and P -values*

3.3 ARDL Bounds Test Results

After settling that none of the variables are I(2), the next step of ARDL procedure is to estimate the three models and test for the presence of cointegration among the variables of equation (3), (4) and (5). The AIC selects an ARDL (3, 1, 0) for the variables included in the model 1, while ARDL (1, 3, 1) for the model 2 and ARDL (1, 3, 0) for the model 3. After specifying the optimum lag lengths for the models, we proceed to the ARDL cointegration bounds testing. The result of the F-Statistic is presented in Table 3. Table 3 shows that the computed F- statistics are 6.71 and 6.06 respectively for model 1 and model 2 which are both higher than the upper bound critical value of 5 at 1% level of significance. Therefore, the long-run relationship among the economic growth, exports and imports exist when GDP is dependent on exports and imports, and exports is dependent on GDP and imports. However, the long-run relationship is not evident only when imports is dependent on GDP and exports at 5% level of significance. Thus, we find that the growth-led import and export-led import model are not relevant to Bangladesh in the long run.

In order to obtain evidence of whether this cointegration implies trade-led growth (export-led growth or import-led growth or both) or growth-led export or import-led export, the long-run coefficients along with the short run dynamics of model 1 and 2 are estimated. Table 4 illustrates the long run coefficients of model 1 (GDP growth model) and model 2 (Export growth model) from the ARDL (3, 1, 0) and ARDL (1, 3, 1) models respectively selected by the AIC. All of the long-run coefficients of the ARDL models are significant at 1% level suggesting that Bangladesh's exports and imports have a significant long run impact on economic growth. Moreover, GDP and imports also have a positive significant long-run impact on exports growth in Bangladesh. The ARDL results for model 1 (when GDP is a dependent variable) show that export is positively related with GDP, while import is negatively related. The result implies that a 1% increase in exports contributes to 0.91% increase in economic growth in Bangladesh. Besides, a 1% increase in imports contributes to 0.49% decrease in economic growth. Thus, we explore that export-led growth for Bangladesh is absolutely evident, while imports have significant negative effect on output in the long run. The ARDL results for model 2 (when export is a dependent variable) show that both GDP and import are positively and significantly related to export. The result indicates that a 1% increase in GDP contributes to 1.06% increase in exports in Bangladesh. Furthermore, a 1% increase in imports contributes to 0.61% increase in exports. Thus, we can state that growth-led export and import-led export for Bangladesh in the long run is categorically evident.

The short-run dynamics along with the error correction term (ECT) results are reported in Table 5. The results of the estimated ARDL-ECM models clearly indicate that the coefficients of error correction terms of the model 1 and 2 are negative and statistically significant at the 1% level of significance. It suggests that the long-run causality is also directing from exports and imports to GDP, and GDP and imports to exports. The error correction term of model 1 is -0.10, which implies that GDP requires about ten years to converge to equilibrium after being shocked. In contrast, the error correction term of model 2 is -0.87 which implies that 87% of the last year's disequilibrium is corrected this year by changes in exports.

The short run results are totally consistent with that of long-run coefficients. The short-run impact of exports on GDP is also positive and significant, while the role of imports in the short run remains as negative even though significant as before at the 1 percent level. The role of imports in the error-correction model remains as insignificant as before. Like the long run impact, the short-run impact of GDP and imports on exports are also positive and significant meaning that growth-led export and import-led export for Bangladesh are evident. Thus, export-led growth, growth-led export and import-led export models are relevant in Bangladesh both in the short-run and long-run, while the role of imports on economic growth is negative (Fig. 1).

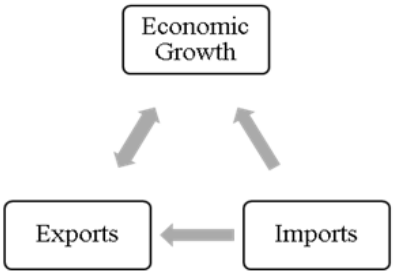

Fig. 1. Trade and growth in Bangladesh

In order to verify the robustness of the models, diagnostic checking of the estimated models

have been carried out in terms of conventional multivariate residual-based tests for serial correlation, normality and heteroscedasticity (Table 6). At 1% level of significance, the Lagrange Multiplier (LM) test for autocorrelation indicates the absence of autocorrelation and ARCH Chi-square test for heteroskedasticity indicates the absence of heteroskedasticity. The model also passes the Jarque- Bera normality test at 1 percent suggesting that the error is normally distributed in the models.

Finally, following [20], the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of the recursive residuals (CUSUMSQ) tests are employed to test for parameter stability. Figs. 2 and 3 plot the CUSUM and CUSUM of squares statistics for model 1 and 2 respectively. The plotted points for the CUSUM and CUSUMSQ statistics for both models stay within the critical bounds of a 5% level of significance. Thus, these statistics confirm the stability for all coefficients of the estimated equations.

Table 3. Results of ARDL bounds cointegration test

Model: dependent variable	Forcing variables	F-statistics	5% Critical bounds		1% Critical bounds		Remarks
			I(0)	I(1)	I(0)	I(1)	
1: ∆Y	X, M	6.71*	3.1	3.87	4.13	5	Present
2: ∆X	Y, M	6.06*	3.1	3.35	4.13	5	Present
3: ∆M	Y, X	1.37	3.1	3.87	4.13	5	Absent

*Note: * denotes rejection of the null hypothesis at the 1% level*

Table 4. Long-run Coefficients for ARDL (3, 1, 0): Model 1 and ARDL (1, 3, 1): Model 2

Model	Variable	Coefficient	Std. Err.	P-value	Long-run cointegration equation
1: ∆Y	C	16.57*	0.53	0.00	Y = 16.57 + 0.91 X – 0.49 M
	X	0.91*	0.11	0.00	
	M	-0.49*	0.10	0.00	
2: ∆X	C	-18.49*	1.73	0.00	X = -18.49 + 1.06 Y + 0.61 M
	Y	1.06*	0.11	0.00	
	M	0.61*	0.06	0.00	

*Note: * denotes the coefficients are significant at the 1% level*

Table 5. Error correction estimates

Variable	Coefficient	Std. Error	t-statistic	P-Value
		Model 1		
D[Y(-1)]	-0.50*	0.15	-3.35	0.00
D[Y(-2)]	-0.32**	0.13	-2.52	0.01
D(X)	0.07*	0.01	5.12	0.00
D(M)	-0.05*	0.01	-3.51	0.00
ECT(-1)	-0.10*	0.01	-6.99	0.00
		Model 2		
D(Y)	5.93*	1.11	5.33	0.00
D[Y(-1)]	3.57**	1.29	2.77	0.01
D[Y(-2)]	3.51*	0.94	3.75	0.00
D(M)	0.73*	0.06	11.69	0.00
ECT(-1)	-0.87*	0.17	-5.21	0.00

*Note: *and** denote significance at 1% and 5% levels respectively*

Table 6. Results of diagnostic tests

Diagnostic tests	Model 1		Model 2	
	Statistics	P-value	Statistics	P-value
Serial correlation LM	$\chi^2 = 5.93$	0.12	$\chi^2 = 1.41$	0.70
ARCH heteroskedasticity	$\chi^2 = 0.77$	0.39	$\chi^2 = 0.92$	0.34
Jarque-bera normality	1.25	0.54	1.18	0.55

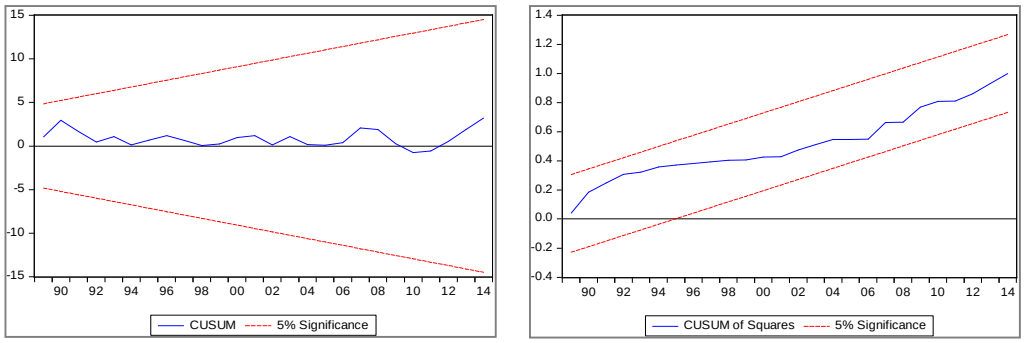

Fig. 2. Plots of CUSUM and CUSUMSQ stability test for model 1

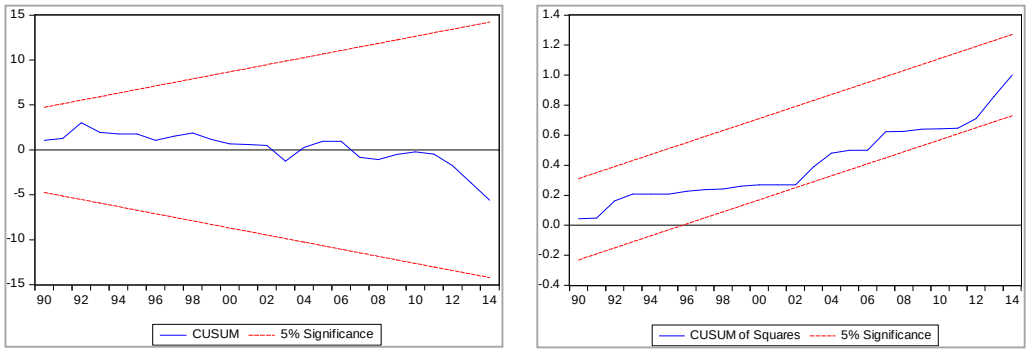

Fig. 3. Plots of CUSUM and CUSUMSQ stability test for model 2

4. CONCLUSION

This study uses annual data of real GDP (proxied for economic growth), exports and imports from 1979 to 2014 to explore whether the trade-led growth hypothesis or growth-led trade hypothesis is functioning in Bangladesh. The newly developed ARDL bounds test approach reveals that the long run cointegration exists among the economic growth, exports and imports when GDP is dependent on exports and imports, and exports is dependent on GDP and imports. When GDP is a dependent variable, the long run coefficients of ARDL results show that exports is positively related with GDP, while imports is negatively related at 1% level of significance. Additionally, GDP and imports also have a positive and highly significant long-run impact on exports in Bangladesh. The correctly negative signed and highly significant error correction terms of the two models suggest that the long-run causality is directing from exports and imports to GDP, and GDP and imports to exports. The error correction terms of model 1 and 2 indicate that 10% and 87% of the last year's disequilibrium are corrected this year by changes in GDP and exports respectively. All of the short-run coefficients of the models are significant and consistent with the long run results suggesting that export-led growth, growth-led export and import-led export models are valid in Bangladesh both in the short run and long run. Even though the role of imports on economic growth is negative, imports play a significant role to foster exports in Bangladesh both in the short-run and long-run. One of the key policy implications obtained from this study is that Bangladesh cannot decrease imports of capital goods for its influence on readymade garments dominated exports. Moreover, the bidirectional causality between real GDP and real export carries a great significance for a small economy like Bangladesh. Government of Bangladesh should therefore design effective export promotion policy to diversify export basket owing to obtain the greater benefits of export-led growth and growth-led export. Finally, we realize from this empirical study that trade liberalization significantly benefits the economic growth in Bangladesh.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Irwin DA. A brief history of international trade policy; 2011.
   Available:http://www.econlib.org/library/Columns/Irwintrade.html#
   (Accessed 12th December 2015)
2. Chen H. A literature review on the relationship between foreign trade and economic growth. International Journal of Economics and Finance. 2009;1(1):127-131.
3. Mahroowal M, Sarmidi T, Nor AHSM. Exports, imports and economic growth nexus in Afghanistan. Paper Presented at the International Management Accounting Conference; 2014.
   Available:http://conference.ukm.my/IMAC/IMAC7/paper/view/2331
4. Dodaro S. Exports and growth: A reconsideration of causality. Journal of Developing Areas. 1993;27:245-278.
5. Mallick S. Causality between exports and economic growth in India: Evidence from cointegration based error-correction model. Indian Journal of Economics. 1996; 76(302):307-320.
6. Ogbokor. Time series evidence for export-led growth paradigm: A case study of Zimbabwe. Journal of Social Sciences. 2005;1(2):77-80.
7. Begum S, Shamsuddin AFM. Exports and economic growth in Bangladesh. Journal of Development Studies. 1998;35:89-114.
8. Hossain MA, Karunaratne ND. Exports and economic growth in Bangladesh: Has manufacturing exports become a new engine of export-led growth? International Trade Journal. 2004;18(4): 303-334.
9. Mamun KAA, Nath HK. Export-led growth in Bangladesh: A time series analysis. Applied Economics Letters. 2005;12(6): 361-364.
10. Paul BP. Testing export-led growth in Bangladesh: An ARDL bounds test approach. International Journal of Trade, Economics and Finance. 2014;5(1):1-5.
11. Hassan MM. Exports, imports, and growth nexus in Bangladesh: Facts from causality and cointegration analysis. The Economic Journal of Nepal. 2011;34:4.
12. Razzaque A, Khondker BH, Ahmed N, Mujeri MK. Trade liberalization and economic growth: Empirical evidence on Bangladesh. MAP technical paper, Bangladesh Institute of Development Studies; 2003.
    Available:https://idlbnc.idrc.ca/dspace/bitstream/10625/31979/1/118892.pdf
    (Accessed 14 December 2015)
13. Love J, Chandra R. Testing export-led growth in Bangladesh in a multivariate VAR framework. Journal of Asian Economics. 2005;15(6):1155-1168.
14. Islam F, Hye QMA, Shahbaz M. Import-economic growth nexus: ARDL approach to cointegration. Journal of Chinese Economic and Foreign Trade Studies. 2012;5(3):194-214.
15. Hye QMA, Wizarat S, Lau W. Trade-led growth hypothesis: An empirical analysis of South Asian countries. Economic Modelling. 2013;35:654-660.
16. World Bank. World Development Indicators; 2015.
    Available:http://databank.worldbank.org/data/reports.aspx?source=world-evelopment-indicators#
    (Accessed 02 January 2016)
17. Gujarati DN. Basic Econometrics. 4th ed. McGraw-Hill Book Company, Singapore; 1995.
18. Pesaran MH, Shin Y, Smith RJ. Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics. 2001;16:289-326.
19. Johansen S, Juselius K. Maximum likelihood estimation and inference on cointegration with applications to the demand for money. Oxford Bulletin of Economics and Statistics.1990;52(2):169-210.
20. Pesaran MH, Pesaran B. Working with Microfit 4.0: Interactive Econometric Analysis. Oxford University Press; 1997.
21. Pesaran MH, Shin Y. An autoregessive distributed lag modelling approach to cointegration analysis. Chapter 11 in S.

Strom (ed.), Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium. Cambridge University Press, Cambridge; 1999.

22. Al-Assaf G, Al-Abdulrazag B. The validity of export-led growth hypothesis for Jordan: A bounds testing approach. International Journal of Economics and Financial Issues. 2015;5(1):199-211.

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