TRADE POLICY AND ECONOMIC GROWTH IN BANGLADESH: A REVISIT

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Abstract. The paper examines trade policy and economic growth for Bangladesh. The paper has employed cointegration and multivariate Granger Causality test developed by Toda and Yamamoto (1995) to study the long-run and short-run dynamics among exports growth, imports growth and real output growth over the period 1973 to 2002. Our results strongly support a long-run relationship among the three variables for Bangladesh. The results show feedback effects between exports and output growth and also between imports and output growth in the short-run. A strong feedback effects between import growth and export growth has also been established.

I. INTRODUCTION

The justification for free trade and the various indisputable benefits that international specialization brings to the productivity of nations have been widely discussed in the economic literature (see *e.g.* Bhagwati, 1978; Krueger, 1978). The suitability of trade policy — import substitution or export promotion — for growth and development has been also debated in the literature. In 1950s and 1960s, most of the developing countries followed import substitution (IS) policies for their economic growth. The proponents

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of the IS policy stress upon the need for developing countries (LDCs) to evolve their own style of development and to control their own destiny. This implies policies to encourage indigenous, policies as stated by Arrow, "learning by doing" in manufacturing and the development of indigenous technologies appropriate to country's resource endowments (*see* Todaro and Smith, 2003: p. 556). Since mid-1970s, in most developing countries, there has been considerable shift towards export promotion strategy (EP), particularly, in the era of globalization and introduction of WTO regimes. This approach postulates that export expansion and may also leads to efficient resource allocation, economies of scale and production efficiency through technological development, capital formation, employment generation and hence acceleration of economic growth.

Theoretical agreement on export-led growth emerged among neoclassical economists after the successful story of newly industrialized countries. They argue that, for instance, Hong Kong (China), Taiwan, Singapore and the Republic of Korea, the Four Tigers, have been successful in achieving high and sustained rates of economic growth since early 1960s; because of their free-market, outward-oriented economies (see, *e.g.* World Bank, 1993). However, the reality of the tigers does not support this view of how their export success was achieved. The production and composition of export was not left to the market but resulted as much from carefully planned intervention by the governments. As Amsden (1989) states that the approach behind the emergence of this new 'Asian Tiger' is a strong, interventionist state, which has willfully and abundantly provided tariff protection and subsidies, change in interest and exchange rates, management investment, and controlled industry using both lucrative carrots and threatening sticks.[1]

Nevertheless, export-led growth hypothesis has not only been widely accepted among academics (Feder, 1982 and Krueger, 1990) and evolved into a "new conventional wisdom" (Tyler, 1981; Balassa, 1985), but also has shaped the development of a number of countries and the World Bank (World Bank Development Report, 1987).

The literature, which has an extensive inventory of models that stress the importance of trade in achieving a sustainable rate of economic growth, have

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[1]Japan's development is also narrated in Inc., Three tiers, bureaucrats, banks and businessman. These three quarters joined hands and cooperated to accelerate growth in Japan. Recently development of hosiery and other cotton related product's development in Bangladesh is a good example of such development, *i.e.* from imported inputs.

focused on different variables, such as degree of openness, real exchange rate, tariffs, terms of trade and export performance etc., to verify the hypothesis that open economies grow more rapidly than those that are closed (see *e.g.* Edwards, 1998). The advocates of the export-led strategy and free trade point out that most developing countries, mostly in Latin America, which followed inward-oriented policies under the import substitution strategy (IS), had poor economic achievements (Balassa, 1980).

Thereafter, many LDCs were forced to stimulate their export-led orientation, even more because most of them have to rely on multilateral organizations, to implement and adjust stabilization programs to improve their economic imbalances. Promoting exports would enable LDCs to improve imbalances in the external sector and at the same time assist them in their recovery. Consequently, numerous empirical research works has been done on the relationship between exports and growth. However, the results are not consistent for both developed and developing countries. Thus, further research in this regard will strengthen the debate on export led growth.

Given the above background, in this paper an attempt has been made to reinvestigate the relationship between export promotion and economic growth in the case of Bangladesh. The paper investigates not only the existence of a long-run relationship among economic growth, exports and imports, but also explores the short-run causal relationship between these variables for Bangladesh by employing the multivariate Granger causality methodology developed by Toda and Yamamoto (1995). Hardly any comprehensive study has been done so for to examine the existence and nature of any causal relationship between output, imports and exports by employing Toda and Yamamoto's (1995) multivariate Granger causality procedure for Bangladesh, so far.

The rest of the paper is organized as follows: Section II provides a brief overview of the economy. Section III consists upon review of literature. Section IV discusses data and methodological issues. Section V presents empirical findings. Section VI concludes the paper.

II. THE BANGLADESH ECONOMY AND PERFORMANCE OF FOREIGN SECTOR

Bangladesh has witnessed a respectable growth record in its real GDP, as well as, in various sectors. Average GDP growth rate was 2.3 percent in 1970s, increased to 4.8 percent during 1980s and 1990s, respectively. The growth rate remained in the range of 4.8 percent to 5.4 percent in the recent years. The GDP growth rate is broad based extending to over all major

sectors of the economy. Agricultural sector's growth rate, which was very low in 1970s, increased to 2.7 percent and further to 2.9 percent during 1980s and 1990s, respectively. However, it dropped and again picked up to 3.3 percent in 2003. The recent growth was 3.7% in 2006. Industrial and services sectors showed a good growth performance over past decades, and also showed a good performance in the recent years (*see* Table 1). During 2000-05, average per year GDP growth was 5.5% while industrial sector grew by 7.5% during the same period.

TABLE 1

Gross Domestic Product and Sectoral Growth Rate

	1970-80	1980-90	1990-00	2001	2003	2000-05 (Average)
GDP	2.3	4.8	4.8	4.8	5.4	5.5
Agriculture	0.6	2.7	2.9	3.1	3.3	3.3
Industry	5.2	4.9	7.3	7.4	7.3	7.2
Manufacturing	5.1	3.0	7.2	–	–	–
Services	3.8	4.4	4.5	5.5	5.8	5.5

Source: *World Development Indicators* (various issues), *Economic Bulletin* (2007).

There has been a structural change in the economy over the past decades. The share of agricultural sector in GDP declined form 32.0 percent in 1981 to 20.2 percent in 2005, while that of industrial sector's contribution to GDP increased from 22.0 percent in 1981 to 28.3 percent in 2005. The share of services sector in GDP remained in the range of 46 percent to 49.4 percent during the same period (*see* Table 2). Despite the fact that a sharp structural change took place in the economy, yet it is heavily based on agricultural sector in terms of support to industrial sector and employment generation.

Bangladesh like other countries of the region concentrated initially on the import substitution policy with different trade barriers. This is reflected in its share of trade in GDP. However, over time it has opened its economy

to external trade. The share of total trade is almost doubled over two decades (*see* Table 3).

TABLE 2

Sectoral Composition of Gross Domestic Product

Sector	1981	1995	1998	1999	2000	2001	2002	2005
Agriculture	32.0	25.0	24.0	25.0	25.6	25.0	24.0	20.2
Industry	22.0	24.0	25.0	24.0	25.7	26.2	26.7	28.3
Services	46.0	51.0	51.0	50.0	48.7	48.8	49.3	49.4

Source: *World Development Indicators* 2001 and the figures for 2000 to 2005 taken from http://www.bangladesh-bank.org/pub/annual/anreport/ar0203/chap1.pdf. *Economic Bulletin* (2007).

TABLE 3

Trends of Trade (% of GDP)

	1960	1970	1980	1990	1998	2002	2005
Exports as % of GDP	7.40	6.20	4.20	6.30	13.80	12.47	15.4
Imports as % of GDP	8.10	10.80	15.90	13.80	18.90	16.20	23.1
Total Trade as % of GDP	15.50	17.00	20.10	20.10	32.70	28.67	38.5

Source: *World Development Indicators* 2001 and the figures for 2000 to 2005 are retrieved from http://www.bangladesh-bank.org/pub/annual/anreport/ar0203/chap9.pdf.

Bangladesh has taken many steps to open its economy and to boost its exports. A number of export support measures are in the operation. These among other include simplifying export procedures and helping the private sector achieve efficiency, enhancing technological strength and productivity, ensuring maximum use of local materials in the production of export goods and encouraging establishment of backward linkage industries, participate in the international trade fairs and specialized fairs, making appropriate development and expansion of infrastructure conducive to export, and taking necessary steps .to assist procurement of raw materials by the export-oriented

industries at world price. The other export support measures are 'Special Bonded Warehouse', the 'Duty Drawback System', 'Export Development Fund' and 'Export Credit Guarantee Scheme'. It has also adopted liberal foreign investment policies to attract private investment in the export sectors.

III. REVIEW OF LITERATURE

Generally, the empirical studies regarding the relationship between exports and output growth can be separated into two categories. The first type of empirical investigation focuses on cross-section analysis, and the second concentrates on country-specific studies; time series analysis.

In the cross section analysis, Kravis (1970), Michaely (1977), Bhagwati (1978), and to name a few, use the Spearman's rank correlations test to explore the relationship between exports and growth, while Balassa (1978, 1985), Tyler (1981), Kavoussi (1984), Ram (1987), Heitger (1987), Fosu (1990) and Lussier (1993) investigate exports and growth performance within a neoclassical framework by using ordinary least squares (OLS) on cross section data. These studies, in general, find that export is an important variable in determining economic growth. Gonclaves and Richtering (1986) conduct empirical analysis for a sample of 70 developing countries for the period 1960-1981, and find that export growth rate and change in export/ GDP ratio are significantly correlated with GDP growth. Sheehey (1993) finds inconsistent evidence of higher productivity in the export sector compared with the non-export sector, while, Colombatto (1990), using OLS, with a sample of 70 countries, rejects the export-led growth hypothesis.

Cross sectional empirical investigations can explain to some extent why growth differs across a wide spectrum of countries. Nevertheless, this type of cross-section investigation has its deficiencies, which raises doubts about their usefulness. In these studies, countries in similar stages of development were grouped together. Implicitly assume a common economic structure and similar production technology across different countries. However, this assumption is most likely unrealistic. Thus, the results reported in theses studies are clearly vulnerable to criticism. Moreover, cross sectional analysis ignore the shifts in the relationship between variables overtime within a country, while export growth and economic growth is a long-run phenomenon, which can not be studied by using cross sectional analysis.

With recent developments in econometrics, emphasis has been given to the time series analyses to determine a long-term relationship between exports and economic growth and the direction of causality, if such relationship exists. It may be pointed out that the most recent time series investigations

concerning LDCs that have used the econometric methodology of cointegration have not been able to establish unequivocally that a robust relationship between these variables indeed exist in the long term, (see *e.g.* Islam, 1998). While, some have been able to find a long-run relationship; many others have rejected the export-led hypothesis.

Some studies also find that the effect of exports on economic growth depends on the level of development of the country concern and the composition of exports itself (see *e.g.* Tyler, 1981; Dadaro, 1991; Michaely, 1977; Singer and Gray, 1988; Watanabe, 1985; and Kavoussi, 1985).

Jung and Marshall (1985), for instance, based on the standard Granger causality tests, analyze the relationship between export growth and economic growth using time series data for 37 developing countries and find evidence for the export-led growth hypothesis in only 4 (Indonesia, Egypt, Costa Rica, and Ecuador) out of the 37 countries included in the sample. Using causality test, Chow (1987) investigates the causal relationship between export growth and industrial development in eight newly industrialized countries (NICs). It is revealed that in most NICs (except Argentina) there is strong bi-directional causality between the export growth and industrial development. Chow's results are in contrast to Jung and Marshall for four out of six countries common in the two samples, namely Brazil, Korea, Mexico and Taiwan. More specifically, as opposed to Chow's evidence of dual causality between exports and economic growth, Jung and Marshall find no significant causality in Brazil or Mexico, and causality only from output to exports in Korea and Taiwan. The contrast in empirical findings of the two studies may be partly explained by the fact that Chow uses output of the manufacturing sector as a measure of aggregate output as opposed to Jung and Marshall (1985), who utilize gross domestic product.

Darrat (1986), in a study of four Asian NICs (Hong Kong, South Korea, Singapore, and Taiwan), finds no evidence of unidirectional causality from exports to output in all the four economies. In the case of Taiwan, however, the study detects unidirectional causality from output growth to export growth. In another study, Darrat (1987) rejects the export-led growth hypothesis in three out of four cases. He supports the case of Republic of Korea only. Likewise, Ahmad and Kwan (1991) reject the export-led growth hypothesis in their empirical study of 47 African developing countries. Bahmani-Oskooee *et al.* (1991), based on a sample of 20 less-developed countries, find the support of export-led growth hypothesis only in the case of Indonesia, Korea, Taiwan and Thailand. Their study confirms the finding of Jung and Marshall (1985) for Indonesia; still two studies reach different

conclusions for Korea, Taiwan and Thailand. Dodaro (1993) finds a positive causality from exports to GDP in seven out of 87 countries.

Using Error Correction Modeling (ECM) approach, Bahmani-Oskooee and Alse (1993) re-examines the relationship between export growth and economic growth for nine developing countries and find strong support for the export-led growth hypothesis for all the countries included in the sample. Likewise, Dutt and Ghosh (1996) find support for the export-led growth hypothesis in about half of the 26 countries in their study. Furthermore, Xu (1996) also finds support for export-led growth in 17 out of 32 developing countries included in his study. Al-Yousif (1997) uses a multivariate model to examine the relationship in the case of Malaysia. His study supports the export-led growth theory as a short-run phenomenon.

It is commonly accepted that many East Asian countries have achieved higher rates of economic growth through export-led industrialization; however, the empirical evidence is generally mixed. Ghartey (1993), using a vector auto-regressive model for Taiwan, USA and Japan, finds export-led growth in Taiwan, economic growth Granger-causes export growth in the USA, and a feedback causal relationship exists in the case of Japan. On the contrary, Kwan *et al*. (1996) find mixed results for Taiwan, while Boltho (1996) finds that domestic forces rather than foreign demand propelled long run growth in Japan. Ahmed and Harnhirun (1996) find no support for the export-led growth hypothesis for five ASEAN economies. Gupta (1985) finds bi directional association between exports and economic growth for Israel and South Korea.

Nandi (1991) and Bhat (1995), for example, find evidence of export-led growth hypothesis for India, while Ghatak and Wheatley (1997) find that export growth is Granger-caused by output growth in India. On the other hand, Xu (1996) rejects the export-led growth hypothesis for India for the period 1960-1990.

Recent studies carried out pertaining to Pakistan. Khan and Saqib (1993) use a simultaneous equation model and find a strong relationship between export performance and economic growth in Pakistan. Mutairi (1993) finds no support for the period 1959-91, while Khan *et al.* (1995) find strong evidence of bi-directional causality between export growth and economic growth for Pakistan.

Rana (1985) estimates an export-augmented production function for 14 Asian developing countries including Bangladesh. The evidence supports that exports contribute positively to economic growth. Ahmed *et al.* (2000)

investigate the relationship between exports, economic growth and foreign debt for Bangladesh, India, Pakistan Sri Lanka and four South East Asian countries using a trivariate causality framework. The study rejects the export-led growth hypothesis for all the countries (except for Bangladesh) included in the sample. Kemal *et al.* (2002) investigate export-led hypothesis for five South Asian Countries including Pakistan, India, Bangladesh, Sri Lanks and Nepal. The study finds a strong support for long-run causality from export to GDP for Pakistan and India, and bi-directional causality is found for Bangladesh, Nepal and Sri Lanka. The study also finds short-run causality from exports to GDP for Bangladesh and Sri Lanka, and reverse short-run causation — from GDP to exports — for India and Nepal.

FIGURE 1

Economic Growth, Imports and Exports Growth in Bangladesh
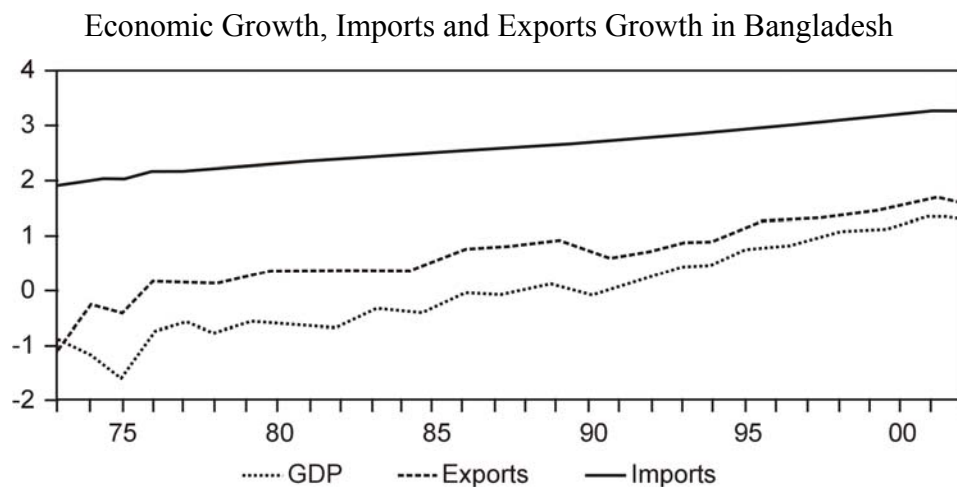
Though, results of these studies are mixed, however, in general we may say that the level of development is an important factor in determining the export-economic growth relationship. The above-cited studies, implicitly assume that such economies are rich in resources and homogenous in the export structure and can implement the export expansion policies at a sufficiently fast rate. Developing economies, such as Bangladesh, where domestic resources6 are limited, export expansion still needs to import some goods that do not exist in domestic market but play a key role in the manufacturing of the export driven goods. It still needs to locate and import some necessary technology in order to have a competitive position. This can be seen from Figure 1 where the growth of import and export move in a uniform way. It is important to study whether import as well as export play vital role in economic growth. In other words, if we study the long-run

relationship and causality structure without including import will lead to invalid inference. It may be noted that the approach of using a simple two-variable framework in the causality test without considering the effects of other variable, such as imports, is subject to a possible specification bias.

Keeping in view the above, the paper attempts to reinvestigate not only the existence of a long-run relationship among economic growth, exports and imports by using cointegration techniques, but also to explore the short-run causal relationship between these variables for Bangladesh by employing the multivariate Granger causality methodology developed by Toda and Yamamoto (1995). To the best of our knowledge, no study has been done to examine existence and nature of any causal relationship between output, imports and exports by employing Toda and Yamamoto's (1995) multivariate Granger causality procedure for Bangladesh.

IV. DATA AND METHODOLOGICAL ISSUES

DATA

Annual data from-1973 to 2002 on real GDP, real exports and real imports are retrieved from IMF's International Financial Statistics. All the time series are transformed into logarithms. Plot of the logarithms of the three time series are shown in Figure 1. The Figure shows that the logarithms of real GDP, '*y*' the real export, '*x*' and the real imports, '*m*' exhibit strong upward trends. This provides anecdotal evidence that the three series tend to move together.

THE METHODOLOGICAL ISSUES

1. Cointegration

One of our objectives is to investigate the long-run dynamics relationship among the three variables, *i.e.* Imports and Exports and output growth. The system can be represented as follows:

$$Y_t = \beta_0 + \beta_1 x_t + \beta_2 m_t + \varepsilon_t \tag{4.1}$$

Where the vector (*y*, *x* and *m*) represent log levels of real output, exports and real imports respectively. The coefficients β_1 and β_2 are expected to be positive.

In implementing the tests for cointegration we use the likelihood ratio test due to Johansen and Juselius (1990). The method involves estimating the following unrestricted vector autoregressive (VAR) model:

$$Y_t = A_0 + \sum_{j=1}^{p} A_j Y_{t-j} + \varepsilon_t \qquad (4.2)$$

Where Y_t is an $n \times 1$ vector of non-stationary I(1) variables, in our case $Y_t \equiv$ (y, x and m), n is the number of variables in the system, three in this case. A_0 is a 3×1 vector of constants, p is the number of lags, A_j is a 3×3 matrix of estimable parameters, and ε_t is a 3×1 vector of independent and identically distributed innovations. If Y_t is cointegrated, it can be generated by a vector error correction model (VECM):

$$\Delta Y_t = A_0 + \sum_{j=1}^{p-1} \Gamma_j \Delta Y_{t-j} + \Pi Y_{t-1} + \varepsilon_t \qquad (4.3)$$

Where:

$$\Gamma_j = -\sum_{i=j+1}^{p} A_i \text{ and } \Pi = \sum_{j=1}^{p} A_j - I,$$

Δ is the difference operator, and I is an $n \times n$ identity matrix.

The rank of the matrix Π determines the number of cointegrating vectors since the rank of Π is equal to the number of independent cointegrating vectors. Thus, if the rank of Π equals 0, the matrix is null and equation (5) becomes the usual VAR model in first differences. If the rank of Π is r where $r < n$, then there exist r cointegrating relationships in the above model. In this case, the matrix Π can be rewritten as $\Pi = \alpha\beta'$ where α and β are $n \times r$ matrices of rank r. Here, β is the matrix of cointegrating parameters and α is the matrix of weights with which each cointegrating vector enters the above VAR model. Johansen provides two different test statistics that can be used to test the hypothesis of the existence of r cointegrating vectors, namely, the trace test and the maximum eigenvalue test. The trace test statistic tests the null hypothesis that the number of distinct cointegrating relationships is less than or equal to r against the alternative hypothesis of more than r cointegrating relationships, and is defined as:

$$\lambda_{trace}(r) = -T \sum_{j=r+1}^{p} \ln\left(1 - \hat{\lambda}_j\right) \qquad (4.4)$$

Where T is the number of observations and the λs are the eigenvalues of Π in equation (4.3). The maximum eigenvalue test statistic tests the null hypothesis that the number of cointegrating relationships is less than or equal to r against the alternative of $r + 1$ cointegrating relationships, is defined as:

$$\lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{4.5}$$

One of the critical parts of the Johansen and Juselius approach is to determine the rank of matrix Π, since the approach depends primarily upon a well-specified regression model. Therefore, before any attempt to determine this rank or to present any estimation, the empirical analysis begins with specification and misspecification test. The specification and misspecification test based on the OLS residuals of the unrestricted model in equation (4.2) for the vector Y_t. We use, the most recommended, the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC) to select the lag length of the VAR system, which is achieved by minimizing the AIC and SBC.

2. Multivariate Granger Causality Tests

Apart from the examination of the long-run co-movements of the three variables of interest, we will explore the short-run dynamics by performing Granger causality tests for cointegrating systems. Such an exercise will provide an understanding of the interactions amongst the variables in the system and will shed light on the directions of the causality.

The concept of causality was initially defined by Granger (1969). Broadly speaking, in a bivariate framework, a time series x_{1t} Granger-causes another time series x_{2t} if series x_{2t} can be predicted with better accuracy by using past values of x_{1t} rather than by not doing so, other information is being identical. Testing causal relations between two series x_{1t} and x_{2t} (in bivariate case) can be tested on the following vector autoregressive process of order p.

$$\begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} A_{10} \\ A_{20} \end{bmatrix} + \begin{bmatrix} A_{11}(L) & A_{12}(L) \\ A_{21}(L) & A_{22}(L) \end{bmatrix} \begin{bmatrix} x_{1t-1} \\ x_{2t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{4.6}$$

Where A_{i0} are the parameters representing intercept terms and $A_{ij}(L)$ the polynomials in the lag operator. And $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})$ is an independently and identically distributed bivariate white noise process with zero mean and non-singular covariance matrix. In this process, if $A_{12}(L)$s are statistically significantly different from zero, either in individual coefficient or a subset of coefficients but $A_{21}(L)$ not, then it is said that x_{2t} is unidirectional Granger casual to x_{1t}. On the other hand, if $A_{21}(L)$s are statistically significantly different from zero, either in individual coefficient or a subset of coefficients, but $A_{12}(L)$ not, then it is said that x_{1t} is unidirectional Granger casual to x_{2t}. If

both $A_{12}(L)$ and $A_{21}(L)$ are statistically significantly different from zero, either in individual coefficient or a subset of coefficients in their respective equations, then it is bi-directional causality (feedback effect) between these two variables.

It may be mentioned that the above test is applicable to stationary series. In reality, however, underlying series may be non-stationary. In such cases, one has to transform the original series into stationary series and causality tests would be performed based on transformed stationary series. A special class of non-stationary process is the I(1) process (*i.e.* the process possessing a unit root). An I(1) process may be transformed into a stationary one by taking first order differencing. Thus, while dealing with two I(1) process for causality, equations (4.6) must be expressed in terms of differenced-series. However, if underlying I(1) processes are cointegrated; the specifications so obtained must be modified by inserting the lagged-value of the cointegration relation (*i.e.* error-correction term)[2] as an additional explanatory variable (Engle and Granger, 1987). According to Johansen's (1988), this evidence of cointegration among the variables rules out spurious correlations and also implies at least one direction of Granger causality.

However, Toda and Phillips (1993) provide evidence that the Granger causality tests in ECMs still contain the possibility of incorrect inference. They also suffer from nuisance parameter dependency asymptotically in some cases (see Toda and Phillips, 1993 for details). Therefore, their results are unreliable.[3] All of these indicate that there may be no satisfactory statistical basis for using Granger causality tests in levels or in difference V AR system or even in ECM. The sequential Wald tests of Toda and Phillips (1993) are designed to avoid these problems. Asymptotic theory indicates

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[2]This methodology involves transforming the suggested relationship into an Error Correction model (ECM) and identifies the parameters associated with causality. If the case involves more than two cointegration vectors, this is not easy work.

[3]Further, there is growing concern among applied researchers that the cointegration likelihood ratio (LR) test of Johansen (1998) and Johansen and Juselius (1990) have often not provide the degree of empirical support that might reasonably have been expected for a long-run relationship. Furthermore, using a Monte Carlo experiment, Bewley and Yang (1996) argue that the power of LR tests is high only when the correlation between the shocks that generate the stationary and non-stationary components of typical macroeconomic series is sufficiently large and also that the power of LR tests deteriorates rapidly with over-specification of lag length. This concern has also been supported by the simulation studies of Ho and Sorensen (1996).

that their limiting distributions are standard and free of nuisance. For this reason, we apply the Multivariate Granger causality methodology developed by Toda and Yamamoto (1995)[4] to test the causality among the variables in this paper.

The Advantage of using Toda and Yamamoto's techniques of testing for granger causality lies in its simplicity and the ability to overcome many shortcomings of alternative econometric procedures.

Toda and Yamamoto (1995) proposed a simple procedure requiring the estimation of an 'augmented' VAR, even when there is cointegration, which guarantees the asymptotic distribution of the MWald statistic. All one needs to do is to determine the maximal order of integration d_{max} (where d_{max} is the maximal order of integration suspected to occur in the system), which we expect to occur in the model and construct a VAR in their levels with a total of $(k + d_{max})$ lags. Toda and Yamamoto point out that, for $d = 1$, the lag selection procedure is always valid, at least asymptotically, since $k >= 1 = d$. If $d = 2$, then the procedure is valid unless $k = 1$. Moreover, according to Toda and Yamamoto, the MWald statistic is valid regardless whether a series is I(0), I(1) or I(2), non-cointegrated or cointegrated of an arbitrary order.

In order to clarify the principle, consider the simple example of a bivarite model, with one lag ($k = 1$). That is,

$$
\begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} A_{10} \\ A_{20} \end{bmatrix} + \begin{bmatrix} A_{11}^{(1)} & A_{12}^{(1)} \\ A_{21}^{(1)} & A_{22}^{(1)} \end{bmatrix} \begin{bmatrix} x_{1t-1} \\ x_{2t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}
\tag{4.7}
$$

Here A_{i0} are the parameters representing intercept terms and $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})$ is n independently and identically distributed bivariate white noise process with zero mean and non-singular covariance matrix.

To test that x_2 does not Granger cause x_i, we will test the parameter restriction $A_{12}^{(1)} = 0$. If now we assume that x_{1t} and x_{2t} are I(1), a standard t-test is not valid. We test $A_{12}^{(1)} = 0$ by constructing the usual Wald test based on least squares estimates in the augmented model:

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[4]However, this procedure does not replace the conventional hypothesis testing of unit roots and cointegration ranks. It should be considered as complementary the pre-testing method that may suffer inference biases (Toda and Yamamota, 1995).

$$\begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} A_{10} \\ A_{20} \end{bmatrix} + \begin{bmatrix} A_{11}^{(1)} & A_{12}^{(1)} \\ A_{21}^{(1)} & A_{22}^{(1)} \end{bmatrix} \begin{bmatrix} x_{1t-1} \\ x_{2t-1} \end{bmatrix} = \begin{bmatrix} A_{11}^{(2)} & A_{12}^{(2)} \\ A_{21}^{(2)} & A_{22}^{(2)} \end{bmatrix} \begin{bmatrix} x_{1t-2} \\ x_{2t-2} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (4.8)$$

The Wald statistic will be asymptotically distributed as a Chi Square (χ^2), with degrees of freedom equal to the number of "zero restrictions", irrespective of I(0), I(1) or I(2), non-cointegrated or cointegrated of an arbitrary order.

V. EMPIRICAL FINDINGS

ORDER OF INTEGRATION

Before testing for co-integration, we tested for unit roots in order to investigate the stationarity properties of the data; Augmented Dickey-Fuller (ADF) t-tests (Dickey and Fuller, 1979) and (PP) Phillips and Perron (1988) tests are used for each of the three time series real GDP, real exports and real imports to test for the presence of a unit root. The lag length for the ADF tests was selected to ensure that the residuals were white noise.

The results of the Augmented Dickey Fuller (ADF) test with and without trend as recommended by Engle and Granger (1987) and the Phillips and Perron (1988) test again with and without trend are reported in Table 4.

TABLE 4

Stationary Test Results

Variable	ADF Test		PP Test	
	Without trend	With trend	Without trend	With trend
x	–0.242	–4.383*	–0.597	–4.391**
Δx	–6.438**	–6.302**	–8.118**	–8.949**
m	–2.888	5.936*	–2.8436	–5.850*
Δm	–9.421**	–9.222**	–9.253**	–8.972**
y	3.384	–0.752	–0.907	–3.679
Δy	–9.104**	–4.329**	–8.293**	–8.097**

Notes: ADF means Augmented Dickey Fuller Test and PP denoted Phillips Perron Test.

   Δ denotes first difference. And ** (*) denotes significance at 1% (5%) level.

   m, x and y denote the natural logarithms of Imports, Exports and Output, respectively.

Table 4 shows that the null of unit root cannot be rejected for any of the three level variables. However, the null of unit root is rejected for first differenced variables, indicating that all variables are first differenced stationary or integrated of order one, I(1).

TESTING FOR COINTEGRATION

Having established that all variables in the study are integrated of order one I(1), we proceed to test for cointegration between the variables on levels.

Two time series are cointegrated when a linear combination of the time series is stationary, even though each series may individually be non-stationary. Since non-stationary time series do not return to their long-run average values following a disturbance, it is important to convert them to stationary processes; otherwise regressing one non-stationary process on another non-stationary process can generate spurious results.

Before we run cointegration test, using the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC), the lag length for the VAR system is determined. The lags used by both criteria in the VAR are shown in Table 5. Moreover, since the data are of annual periodicity, an inspection of the results suggests that serial correlation is not a problem when we set the order of the VAR at suggested lags.

TABLE 5

Johansen Cointegration Test Results

(Variables: OUTPUT, EXPORTS and IMPORTS)

(lag = 2)

Null	Alternative	λ_{max} Statistics	Critical Value		Trace Statistics	Critical Value	
			5%	1%		5%	1%
$r = 0$	$r = 1$	31.19**	20.97	25.52	43.78**	29.68	35.65
$r \leq 1$	$r = 2$	10.76	14.07	18.63	10.56	15.41	20.04
$r \leq 2$	$r = 3$	1.81	3.76	6.65	1.81	3.76	6.65

Note: ** and * indicate significance at the 1% and 5%, respectively

The results of their λ-max and trace tests to identify the number of cointegrating vectors are reported in Table 5.

Note that Reinsel and Ahn (1992) argue that in model with a limited number of observations, the likelihood ratio tests can be biased toward finding cointegration too often. Thus, they suggest multiplying the LR test statistics (λ-max and trace) by a factor (T-nk)/T, where T is the effective number of observations, n is the number of variables in the model, and k is the order of VAR, to obtain the adjusted estimates. Table 2 reports these adjusted statistics.

Table 5 shows that the null of no cointegration is rejected using either statistics because both statistics are greater than their critical values. However, the null of at most one cointegrating vector cannot be rejected in favour of $r = 2$. Thus, the empirical support for one cointegration vector implies that all three variables, import, export and output, are cointegrated and follow a common long-run path. This is consistent with our "a priory" expectation that import, export and economic growth are inter-connected.

Table 6 presents the long-run equation, which is derived by normalizing on output based on estimated cointegration coefficient. All the coefficients are positive as expected, that is both exports growth and imports growth contributes to the economic growth for Bangladesh.

TABLE 6

Estimated Cointegration Coefficient Derived by Normalizing on Y

Constant	Export (x)	Import (m)
5.268	0.291 (0.044)	0.238 (0.056)

Note: Standard errors are in the parentheses.

Y = Output

MULTIVARIATE GRANGER CAUSALITY TEST

Since all of above tests confirm cointegration among these variables under study, therefore, the standard Granger causality test is no longer valid in these cases. Hence, we have used multivariate Granger Causality developed by Toda and Yamamoto (1995) to study short-run dynamics among exports growth, imports growth and real output growth.

The results from Table 4 clearly suggest that none of the variables are stationary in level. However, the first differences of these series are stationary. This means that $d_{max} = 1$ in our case. We then estimate a system of VAR in levels with a total of $d_{max} + k$ lags, where k equals to the lag length as shown in Table 5.

Using these information, the system of equations is jointly estimated as a "Seemingly Unrelated Regression Equations" (SURE) model by Maximum Likelihood and computes the MW ALD test statistic as shown in Table 7.

Table 7 shows that the null hypothesis that 'Granger no-causality from export to growth' can be rejected for at 5% level of significance and converse is also true. This shows that there is a feedback effect between exports and economic growth for Bangladesh.

Our results also show that the null hypothesis that 'Granger no-causality from imports to growth' can be rejected at 5% level. The null hypothesis that 'Granger no-causality from growth to imports' can also be rejected at 1% level of significance.

TABLE 7

Multivariate Granger Causality Test Results

Dependent Variable	Source of Causation		
	Output	Exports	Imports
	χ^2	χ^2	χ^2
Output	–	8.21**	8.43**
Exports	11.945***	–	7.62*
Imports	24.279***	26.840***	–

Notes: ***, ** and * indicate significance at the 1%, 5% and 10 % respectively.

These results indicate that in the process of development, it is crucial for developing countries such as Bangladesh to import some needed technology and input material to expand capacity to boost output. It is fact that in the process of growth, imports play important role through different channels. Imports of raw material increase the value added products and import of

necessary technology increase the productive capacity and productivity, which further enhances the growth rate of the economy. Imports generate employment especially in the handling and transportation sectors. It also creates employment indirectly in the wholesale and retail sectors, which positively affects the growth of the economy. Moreover, it also provides cheap products to consumers and unrestricted access to imports also supports by reducing the prices of essential production inputs. The overall effect of this is to increase growth which supports the increase demand of the imports. However, excessive imports of finished goods may replace the domestic output and displace the workers. How much employment will be effected is an empirical question that needs to be investigated.

Our Results show a strong evidence of significant causality between imports and exports in the case of Bangladesh.

VI. CONCLUSION

The importance of international trade and economic growth has been debated over the decades. The suitability of trade policy — import substitution or export promotion — for growth and development has been also debated in the literature. In 1950s and 1960s, most of the developing countries followed import substitution (IS) policy for their economic growth. Sincemid-1970s, most developing countries have been shifting towards export promotion strategy (EP). This approach postulates that export expansion leads to better resource allocation, economies of scale and production efficiency through technological development, capital formation, employment creation and hence economics growth. The export-led growth has been focus of the economic debate. However, results are found to be mixed in the literature.

This paper re-investigated the link between imports, exports and economic growth for Bangladesh. A vector autoregression (VAR) model applying the multivariate Granger causality procedure, developed by Toda and Yamamoto (1995), instead the traditional error correction mode (ECM) has been used to improve the Standard F-statistics in the causality test process and to test the causal link between the growth of exports, imports and thy real output growth.

The empirical results strongly support a long-run relationship among the three variables. Our results show a feedback effect between import and output growth in the short-run for Bangladesh. Study also finds feedback effects between exports and output growth for Bangladesh. Results also show evidence of a strong feedback effects between import and export of the country.

In the light of our results, we suggest that Bangladesh may continue with the imports of necessary raw material for value addition and needed technology to expand capacity and to improve productivity to increase output growth. It may also give full attention to boost up exports and thereby achieving higher economic growth.

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